

Subterranea

September 2009 Issue 20

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In This Issue...

Plate Rails - Surrey
Firestone Quarries

Camden Town's
Rich Railway Heritage

UK Shelter Policy

Coombe Conduit House

Study Weekend - France

Books, News and Reviews

The Magazine of Subterranea Britannica

www.subbrit.org.uk



Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The main focus of interest is on abandoned and forgotten structures and in the case of Cold War structures studies are entirely confined to declassified and decommissioned structures.

The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.

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Front cover photo: A junction of haulageways in Godstone Hill Quarry. The main route running off to the right was formed with plate rails, whereas the passage branching to the left only contains ruts in the floor to guide the quarry cart.

Back Upper: Joseph Williamson's "Double Tunnel" in the Lord Mayor's Stableyard before restoration.

Back Lower: The photograph shows the vaults of the original Goods Depot, started in 1837 and completed in 1839. The vaults were later used by Gilbey's as part of their bonded storage space. The line of paving provided a route for barrows to move barrels of wine and spirits to and from Gilbey's various bonded vaults, and connected with the 1855 Eastern Horse Tunnel, with the vaults under the Interchange forecourts, with their No. 2 bond alongside the North London Railway, and with their No. 1 bond in the Roundhouse. Much of the original vaulted area was subsequently filled in for the construction of the Safeways (now Morrisons) car park, and the line of infilling cuts across the picture. Part of the view is now incorporated in Horse Tunnel Market as boutiques.

All above photos by Nick Catford

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Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the Editor etc are welcome.

However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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From the Chairman

Martin Dixon

I read the other day that only one London Underground station (out of 270) doesn't have any of the letters of the word *mackerel* in it. It struck me as an unlikely fact and I wasn't able to work it out without looking at the answer (see the bottom of the article). It did set me thinking, however, that it is often the small facts about life in general and underground space in particular that are the most interesting. It is the smaller aspects that are also in most danger of being lost – either because of the physical deterioration of sites or because their recording often relies on personal memories rather than formally published material.

How many people noticed on visiting the ROC HQ at York last year that handwritten at the bottom of the list of official phone numbers for Fylingdales and the Fire Service and so on was the number of the local Fish and Chip shop? Just one line on a single piece of fragile paper and so easily lost. It certainly points to an aspect of exercises that might have been difficult to continue if the site was being used 'in anger'.

We saw other interesting written records in our recent visit to the Wellington tunnels in Arras. Written in black

(and hence World War I) was the word *Latrine* – UK soldiers using a word of French derivation. By contrast, written in red (dating from World War II) was *WC* for Water Closet. Just 25 years later and the tables were turned – the local French population now using unarguably English words.

It always intrigues me that the special vocabulary that occurs in almost every industry often has a very localised application. Where I grew up in Yorkshire, a miner's lunch was always 'snap' (and hence 'snap tin', and other derivatives). Pop over the border to Durham and snap becomes 'bait'. Push a bit further into Scotland and the lunch changes to 'piece'. The Cornish industry recognises 'crib' in turn. Research into the terms used in mines outside the UK can give a clue as to which mining areas were populated by which miners.

So as you explore and record our underground heritage, pay particular attention to the details. It is often these smaller factors that really bring a site to life, and introduce a human touch that makes the difference between a spiritless and a living space.

Tube Station answer: St John's Wood

SUBTERRANEAN BRITANNICA DIARY

Summary of Forthcoming Events 2009 -2010

Sub Brit specific events

- 4 - 6 September 2009 Sub Brit UK Study Weekend, Kent (Now Fully Booked)
- 19 September 2009 Paddock (standby Cabinet War Room) Open Day, Dollis Hill
- 10 October 2009 SB Committee meeting
- 17 October 2009 Sub Brit Autumn Day Conference
Royal School of Mines, London
- December 2009 *Subterranea* 21 published
** Copy deadline 1 November **
- 20 March 2010 Hack Green Open Day for Sub Brit
- September Sub Brit UK Study Weekend, Cornwall (TBC)

General events

- 10 – 13 September 2009 Heritage Open Days across UK
- 19 – 20 September 2009 London Open House
- 25 - 27 September 2009 Hidden Earth 2009 (Caving Conference) Churchill, Somerset
- 3-4 October 2009 SFES (French Underground Society) congress in Luxembourg
- 10 - 11 October 2009 London Transport Museum 'Depot' Family Open Weekend, Acton
- 4 - 6 June 2010 NAHMO (National Association of Mining History Organisations)
Conference, Coalpit Heath, South Gloucestershire



Ian Walker 1939 – 2009

Martin Dixon

Ian Walker was a member of Subterranea Britannica for over twenty years and an active participant in many organised events. His quietly spoken but incisive comments and his welcoming style gained him many admirers and friends from across our society. Sadly Ian died in April this year, aged 69, after a brave struggle against cancer.

Ian's profession was as an electrical engineer and he finished his career as Chief Engineer at Quantel, who led the world in the production of digital video technology.

Ian's first job was for a firm of organ makers and from this sprang a lifetime interest in organs and music in general. He moved after a short time to work for the Atomic Weapons Establishment and then moved, via Micro Consultants Group, to Quantel. One of his best-known projects was the creation of the *paintbox* editing package, at the dawn of digital imaging.

Ian attended large numbers of Sub Brit conferences and visits and would often be found at the back of the group, taking in the environment as well as directly presented information. Ian's questions, when they came, were always clear and to the point and without exception added value to the occasion. His characteristic pose, with hands held behind his back, and head slightly to one side, is one that somehow fitted into the scene – observing and understanding without disrupting. Many members will remember Ian attending events in his convertible MG, which he always regarded as a beast of burden rather than a vehicle to be maintained in showroom condition.

As well as his Sub Brit activities, Ian maintained a large number of other interests – somehow finding time to properly devote himself to all of them. He regularly recorded his local newspaper for the blind and partially sighted as part of the *Kennet Cassette*. He used his fine voice to great effect in choral singing, particularly Gilbert and Sullivan works (which his father also sang). I'm sure many members will remember Ian using the resonance of underground space to great effect by singing a whole chord by himself!

Ian also qualified as a private pilot and once flew all his family to the Isle of Wight for a holiday. He was a skilled engineer and with the tools in his superbly equipped workshop he could do everything from changing the engine in a series 1 Land Rover to repairing a rescued Russian teleprinter. A final interest of Ian's that cut across all the others was his love of real ale, well served in a traditional hostelry. In France, however, his tastes usually changed to a glass of *vin rouge*.

One of his greatest passions was the Station X museum at Bletchley Park, where he was actively involved in the rebuilding of a Bombe machine – the electro-mechanical machine used to help decipher Enigma messages in World War II. Originally built in nearby Letchworth, none of the originals survives so the rebuild was from the ground up. Ian spent more than 500 hours building 100 commutators

for the Bombe rebuild.

One of his last outings was to Bletchley where the rebuild was awarded a special prize by the Institute of Mechanical Engineers.

One of Ian's great characteristics was his politeness and consideration. Despite the many high-technology industries around Newbury, Ian

was never able to obtain a broadband service – a matter of some irony. In reminding fellow members not to send him large attachments via email, Ian was always the epitome of civility. He was always, as more than one of our members has commented, the perfect gentleman.

It was in autumn 2007 that Ian was diagnosed with kidney cancer. The local health authority refused to fund the drug *Sutent* which could help fight the cancer. Ian began a well-publicised battle with Berkshire West Primary Care Trust; a battle which ended with victory as the drug was finally approved. Even better news was that the National Institute for Health and Clinical Excellence (NICE) now recommends that *Sutent* be prescribed in similar circumstances. Ian always felt that he was fighting for all of us and passionately believed in the power of individuals in creating change.

Ian's health had ups and downs over the next eighteen months but he was never downhearted. He didn't let the illness get him down and the strongest emotions I heard him express were the sadness that some of the treatments had put him off the taste for real ale! Fortunately Ian was well enough to join the Sub Brit weekend in Yorkshire last September. He drove up the day before and stayed with his daughter Sarah in York and arrived in fine form. As well as the pleasure in seeing him 'back in action', it was a particular delight to find that his taste for fine beer had returned and I and others remember spending two evenings in local pubs in his amiable and generous company.

Sadly Ian's health declined through 2009 and he died on 10 April with his family at his bedside. Although just a few weeks short of his allotted 'three score years and ten', Ian had packed so much into his life. He leaves a widow, Mary, and two daughters of whom he was very proud: Sarah who is an ophthalmologist and Fiona, a novelist.

Subterranea Britannica was well represented at a Celebration of Ian's life held in his local church at Kintbury on 19 June – two days after what would have been his 70th Birthday. Ian also leaves many good friends in Subterranea Britannica who will remember him as an intelligent, knowledgeable, approachable and entertaining colleague.



Annual General Meeting 18 April 2009

Minutes

With Martin Dixon in the Chair, and 90 members present, the meeting started at 10.00am. The Chairman welcomed all members to the 2009 AGM and noted, with regret, the recent death of long-standing member Ian Walker. He then gave a brief explanation of the various General Meetings held during 2008.

1. Apologies for Absence

Apologies were received from MC Black, Michael Dixon, Gavin Coulthard, Mike Barton and Bob Jenner.

2. Minutes of 2008 AGM

The minutes of the 2008 AGM and EGMs were circulated to members at the meeting. Acceptance was proposed by Andrew Smith, seconded by John Burgess, and approved by members *nem con*.

3. Annual Report

The Chairman's Report for the period ending December 2008 had been circulated to all members prior to the meeting. Acceptance was proposed by Mike Stace, seconded by Nick Catford, and approved by members *nem con*.

4. Accounts

The Directors' Report and Financial Statements for the period 6 December 2007 to 31 December 2008 were circulated to all members prior to the meeting. The Treasurer explained that the accounts were now presented in a new format, to reflect the Limited Liability status of Subterranea Britannica.

Acceptance was proposed by John Burgess, seconded by Bob Clary, and approved by members *nem con*. Gerald Tagg commended the Treasurer on the clarity of the accounts presented, and Terry Wiseman proposed a formal vote of thanks to the Treasurer, which was approved *nem con*.

5. Subscriptions

The Treasurer explained that, although it appeared there was a satisfactory accumulated surplus of more than £9,000, when all adjustments were made this translated to a surplus of only £32 for the period. Excluding the contribution of 'self-funding' activities, the underlying deficit was £588.

Looking forward, in view of increased postage costs (up 11%), increased production costs for *Subterranea*, the plan to reprint the Handbook and produce a Site Directory, and the intention to publish a special, extra, issue of *Subterranea* featuring Corsham, a proposed increase in subscriptions was to be considered.

There was a healthy discussion about the necessity for any increase. John Burgess queried whether it was sufficient, whilst Brian Hillman and Andrew Smith expressed their opposition to any increase. Michael Mortimer suggested that provision should be made on subscription notices for voluntary donations to be added, and this was agreed by the meeting *nem con*. Richard Lamont supported the increase, and Ian Davidson noted that membership represented very good value for money. Nick Catford said that he, reluctantly, supported the increase, but noted that membership renewals were running at a higher rate than last year so that, perhaps, the recession was not impacting renewals as had been previously thought. There was general agreement that every effort should be made to keep costs under control, and that subscriptions should not be increased too frequently. The Chairman noted that, if Subterranea Britannica achieved Charitable Status, there might be additional revenue from the Gift Aid Scheme.

The motion "that annual subscriptions for UK members should be increased to £18 (UK Members) and £26 (Overseas Members)" was proposed by the Committee, and agreed by a clear majority of members, with four abstentions.

6. Election of Officers and Committee

The Chairman advised that the following nominations for officers and committee members had been received:

Chairman:	Martin Dixon	Member	Paul Sowan
Vice-Chairman	Linda Bartlett	Member	MC Black
Secretary	Roger Starling	Member	Bob Templeman
Treasurer	Sue Monsell	Member	Hugh Ainsley
Membership Secretary	Nick Catford		

No additional nominations had been received, and the proposed number of committee members was within constitutional limits. The motion that election of the committee should be considered "en bloc" was proposed by Andrew Smith, seconded by Gerald Tagg, and approved with one abstention.

The election of the Officers and Committee for 2009/2010 was proposed by Tim Robinson, seconded by Robin Ware, and approved with one abstention.

[NB In addition, Brian Hillman (Day conferences), Andrew Smith (Media relations) and Gavin Saxby (Website manager) have the right, but not the duty, to attend committee meetings as non-voting members.]

The Meeting ended at 10.35am.



BOOK REVIEWS

COLLIERY VENTILATION

HILL, Alan, 2000, *The history and development of colliery ventilation*. Matlock Bath: Peak District Mines Historical Society: 216pp [ISBN 0-904334-19-8]

Anybody who has been in a working coal-mine will know what a different experience this is to visiting even the best preserved publicly accessible deep collieries such as Caphouse [the National Mining Museum for England] near Wakefield, or Blegny, near Liège. My own recollections of two visits to Betteshanger colliery in east Kent, for example, are of something like walking in a wind tunnel: there was a strong, chilly draught all the way round the workings, and from time to time it was necessary to pass through air-locks. In a 'museum' deep mine, the air is relatively still, and there are no air-doors to push open against the air flow.

Alan Hill, who worked in the coal industry, has produced an authoritative and thoroughly researched book. Although over 70 percent of this work is concerned, in great detail, with the technicalities of mechanical ventilation, the first thirty or so pages provide an excellent introduction to the subject of underground atmospheres and the means taken to make the miner's working environment comfortable and safe.

Whereas small, shallow mines were often more or less naturally self-ventilated by convection currents, ever deeper and more extensive and complex workings called for increasingly complex and expensive air management systems. This results from the high UK geothermal gradient, of the order of about 1 °C increase in temperature for every additional 100 metres of depth, and the actual or potential presence in mine air of water vapour (which encourages spontaneous combustion of coal), methane, carbon dioxide, carbon monoxide, and even hydrogen sulphide. The history of methods of artificially ventilating mines, from the arrangements depicted in Agricola's sixteenth-century work *De re metallica* onwards, is outlined, encompassing primitive mechanical devices, water-fall and steam-jet arrangements, and furnace shafts.

Deep coal mines are especially problematic, as besides almost inevitably having much more of a methane problem than other mines, leading in due course to carbon dioxide and carbon monoxide problems, they tend to develop very extensive and complex networks of tunnels, on one or more stratigraphic horizons. Additionally, there are usually very extensive areas back-filled with potentially gas-generating waste rock. Any worthwhile colliery ventilation system has to ensure that a certain minimum air flow circulates through every metre of open passage and (more problematically) dead-ended headings, in sufficient volume and at sufficient velocity to remove hazardous gases from the adjoining backfilled areas, as well as from the open passages themselves.

Thus the complex systems of bratticing and air-locks found in coal mines.

How important a factor this is in colliery management is underlined by such statistics as up to 40 percent of a mine's energy consumption reportedly being used to ensure adequate ventilation. The mass of air moved up a mine's upcast shaft can be from six to twelve times the mass of coal raised. Putting the figures another way, something like 1,500 tonnes of air have to be moved to raise one tonne of coal.

The book concludes with a chronology of dates of key events, details of patents relating to ventilation, details of historically important surviving ventilating machinery, and an index. References to published literature and other sources occur throughout the text.

Although the mechanical details will probably be taken for granted and not read by most readers, the historical and technical introduction to this well-researched book is recommended to anybody interested in the history of mining in general, and of course coal mining in particular. [Paul W. Sowan]

SECRET LONDON

Duncan, Andrew, 2009, *Secret London. New edition*. London: New Holland Publishers (UK) Ltd: 192pp [ISBN 978-1-84773-315-3]

Andrew Duncan, a 'professional historian and expert on London' according to the cover of this book, believes our capital city is best appreciated and understood by walking its streets. This volume must be amongst the best of its class, as the author's approach encompasses both the all-too-obvious built landscape, and the underlying natural landscape of Thames river terraces, shallow river valleys (in which most of the rivers are now culverted), and intervening spurs of higher land. Under the chapter headed 'Hidden Landscape' he sets out detailed notes for walks on the Campden and Islington Spurs, and in the valleys of the Westbourne, Tyburn, and Fleet rivers. Although the main body of the book describes and explains places and structures the pedestrian can readily visit, there is a chapter on 'The subterranean city' which deals with hidden places which are generally definitely not open to the public such as 'underground citadels', deep-level shelters, disused underground stations, utility subways, and so forth. Of course surface clues to the existence of quite a few such sites (the Kingsway tram subway, for example, or the former London Hydraulic Power Company's tunnel access near the Tower of London) can be seen by the passer-by, so it is good to find them noticed in a book for observant explorers on foot. The assistance of Roger Morgan, of Subterranea Britannica, is acknowledged for this chapter.

Other chapters deal with specific areas such as the City, Westminster, Whitehall, St James's, etc. There is a useful section at the end of the book detailing opening times, addresses, and further information. Interestingly, for a

guidebook, there is a selected bibliography of well-chosen titles for further reading (including *Lost Rivers of London*, and *War Plan UK*). And an index. [Paul W. Sowan]

COAL MINING IN MORLEY

Jim THORP, 2009, *Coal mining in Morley*. Nelson: Northern Mine Research Society [British Mining 87]: 108pp [ISBN 978-0-901450-65-4] [Available from NMRS Publications, The Old Manse, 93 Halifax Road, NELSON, Lancashire BB9 0EQ / mansemins@btopenworld.com / (T) 01282-614615]

Morley, West Yorkshire, has since 1974 fallen within the Metropolitan Borough of Leeds, and lies about seven kilometres southwest of the city centre. Formerly a Borough in its own right, it includes East and West Ardsley, Gildersome, and Drighlington. Bradford lies to the northwest, Batley and Dewsbury (in Huddersfield) to the southwest, and Wakefield to the south and southeast. The sometime scattered rural settlements grew and amalgamated to form a heavily populated and industrialised area with 44 textile mills dating from the 1790s, and at least 87 collieries active during the nineteenth century. Over 250 coal-mine shafts are known. The first 'modern' deep pit, Morley Main, was established in 1855, suffered a disastrous explosion at a depth of 150 yards on 7 October 1872, as a result of which 34 men and boys died, but continued working until 1909. The toll of human misery in 1872 included thirteen widows and fifty or so orphans. The last mine in the district to close, in 1968, was East Ardsley.

This monograph catalogues Morley's mines and describes their history, but understandably (as it is relatively well documented) describes at length the rescue of survivors, bringing to the surface of the dead, and resulting inquests and official investigations.

It was revealed at the official inquiry that there were distinct areas in the mine where naked flames were allowed, and where only safety lamps were to be used. Although smoking underground was banned, it appeared that some of the men had tobacco and matches on their persons, as well as safety-lamp keys which could of course unlock the sealed lamps. The dead and injured suffered burns, suffocation, and broken limbs; one man had a part of his skull blown away. Presumably some of those 'suffocated' actually died of carbon monoxide poisoning resulting from incomplete combustion of methane or coal dust.

Although it was reported that there had been a 'great want of discipline' amongst the miners, the eventual verdict was that the flammable gas had probably been driven out of unventilated 'goaf' (waste rock stacked in worked-out areas of the mine) by a sudden fall of roof. The gas so released had been driven into an 'open flame' area of the mine. The inspector's recommendations included a complete ban on open flames anywhere in the

mine, and the replacement of furnace with mechanical ventilation. 'Furnace' ventilation was effected by a brasier at the bottom of a ventilation shaft whereby air heated by the burning coal removed vitiated air by convection.

UNDERGROUND QUARRIES IN WORLD WAR I NEAR RIBECOURT, FRANCE

BONNARDS, Jean-Yves, and Didier GUÉNAFF, 2005, *Souterraines de la Grande Guerre: d'Attiche aux Cinq Piliers*. Saint-Cyr-sur-Loire: Alan Sutton: 128pp [ISBN 2-84910-237-7] £19.90.

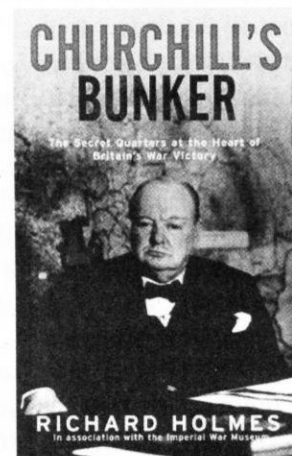
This well-illustrated stiff-back book deals with the opencast and underground building-stone quarries at 'la montagne d'Attiche', a hill of Tertiary rocks lying northwest of Ribecourt (south of Arras and west of Laon), and their rôle on and near the French and German front lines in World War I. The 'quarry of five pillars' is a picturesque relic of an underground building-stone quarry, almost opencasted out of existence on all sides. Numerous contemporary photographs show the French and German forces in, at, and near the underground quarries. There is a chronology of events in this area for the years 1914–18, and a bibliography.

Churchill's Bunker: The Secret Headquarters at the Heart of Britain's Victory by Richard Holmes, Published Imperial War Museum £14.99 hardback (Amazon £8.99)

Reviewed by Lt. Col. James Allason who served in the Cabinet War Rooms.

As war loomed in 1938 Whitehall prepared a series of contingency plans to protect the heart of government from the devastating air raids that had flattened much of Madrid during the Spanish Civil War, and the schemes included the dramatically-named 'Black Move', which required the Cabinet and senior ministers to decamp to three country houses, Spetchley Manor, Bevere House and Hindlip Hall, in Worcestershire. Another project involved the construction of 'citadels' for key service ministries at Cricklewood and Harrow, with the famous Admiralty blockhouse built on The Mall.

In addition, several existing departmental buildings were 'hardened', and a Central War Room was established under Storey's Gate to accommodate the prime minister's secretariat and the War Cabinet. For emergencies, a secret bunker, codenamed PADDOCK, was dug in the grounds of the GPO's large research station at Dollis Hill, but it was only used twice, during exercises to test the speed with which the administration's core could be evacuated to north London in the event of an enemy invasion.





CWR Map Room

In the end Churchill opted for Storey's Gate, later to become known as the Cabinet War Rooms. Perhaps he was unaware that, although reinforced, it was not strictly bomb-proof, and during the Blitz, the renewed Luftwaffe campaign of 1943 and the doodlebug and V-2 onslaught of 1944, it was truly the nerve-centre of the Allied war effort. As Detective Sergeant Cyril Davies, one of Churchill's bodyguards, discovered, when he was wounded by shrapnel from a misfired anti-aircraft gun as he stood by the entrance to the bunker with his charge, not all the danger to the Premier came from the enemy bombers.

Churchill hated changes in the personnel close to him so he retained much the same staff throughout hostilities, and often took night-time strolls across St James's Park with a torch attached to his walking-stick. These are the details recounted faithfully by Richard Holmes, a distinguished military historian who has relied on the accounts of others, such as the late Joan Bright, Jock Colville and 'Pug' Ismay, to capture the flavour of the troglodytic life led underground by the CWR's inhabitants. Combined with access to the relevant war planning records at the National Archive at Kew, the author has covered the site from almost every angle, although members of Sub Brit may note some technical misunderstandings relating to its construction.

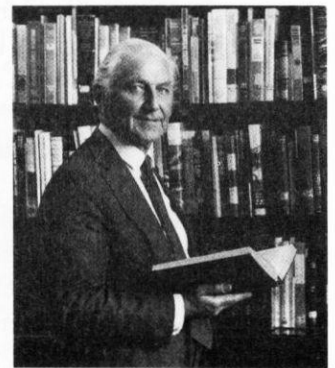
When I arrived there in 1944 to join the Joint Planning Staff, fresh from Mountbatten's headquarters in the Far East, I was impressed by the calm atmosphere and the almost surreal environment, deep under London's pavements, in which far-off battles were being directed. I might take issue with some of the author's assertions regarding the actual prosecution of the war, but his account of the CWR, which strays into the many overseas conferences attended by Churchill, and the way it was managed, is indeed masterful. For me it brings back recollections of the smoky atmosphere pervading the Map Room in which an interservice staff continuously updated the order of battle, and of the Cabinet Room itself, both under constant guard.

Work had started in June 1938, the War Room becoming operational on 27 August 1939, just a week before the declaration of war following the German invasion of Poland. It was designed to house and sleep a permanent staff of 270, with additional offices for regular visitors such as my own team, in some 150 rooms. A sub-basement with low ceilings housed cramped dormitories crammed with bunk beds. The complex was huge, with six acres of floor space and a mile of corridors, but only chemical lavatories. While hardly comfortable the atmosphere was purposeful; few of the visitors escorted in by the Royal Marine guards were left in any doubt that this was the hub of the war effort and centre of decision-making.

Within, the bunker was permanently lit, making it impossible to tell whether it was day or night when you looked at your watch. Winston's bedroom was not close enough to our office to hear him snoring, so the best test was to see whether what we had prepared made any sense when typed up the next day. That composed at 4 pm was notably better than the 4 am version. The Premier's sleeping habits were in any event an unreliable guide, as he was as likely to take an afternoon siesta as he was to keep the Chiefs-of-Staff up most of the night, often with us in attendance. (More frequently, though, he worked and slept immediately above us in the six first-floor rooms of the Number 10 Annexe, the windows barred with steel shutters during the bombing.)

Periodically the Prime Minister would disappear into his private lavatory, which otherwise remained securely locked. And there he would remain for a considerable time, giving rise among the secretaries to a tender concern about his insides. It was a closely guarded secret that behind the door, with its 'Occupied/Vacant' sign, the PM was talking over an encrypted transatlantic radio link to the President of the United States.

My memory of this period remains of night overtaking day as we pored over maps, answered the Prime Minister's questions and drafted reports for the JPS and the Joint Intelligence Committee. Holmes offers a vivid and authentic description of the beehive of activity that finally closed its doors in August 1945, only to be reopened to the public by Margaret Thatcher in 1984. Even better, five years ago the lower level was transformed by the Imperial War Museum into a magnificent tribute to the man consistently voted the greatest Briton of his century.



James Allason's memoir 'Ringside Seat' (Timewell 2007) includes a personal account of life in the Cabinet War Rooms.

NEWS – ARCHAEOLOGY

NOTES ON AN ENIGMATIC STRUCTURE AND POSSIBLE UNDERGROUND SPACE BETWEEN COWGATE CEMETERY AND THE DROP REDOUBT AT WESTERN HEIGHTS, DOVER

Paul W. SOWAN

The following notes were made after a site visit in 1990. In favourable light and visibility, observant visitors to Dover Castle may, on looking across the town and studying the slopes below the Drop Redoubt and Western Heights fortifications, notice an isolated tall slender structure amongst the bushes and trees on the grassy slope.

Closer inspection of this structure, which appears to be a chimney, was made considerably easier in 1990 as a result of the 'White Cliffs Countryside Project' when scrub was cleared and footpaths laid out. One such path leads from the Military Road, along the lower part of the slope, to the public paths and steps by the allotments above Adrian Street.

The supposed chimney, or perhaps ventilation shaft, is brick-built and stands over 60 courses (about 4.5 metres) high. The design is quite elaborate, with a base about 0.95 metres square surmounted by two courses of plinth bricks. The main shaft, about three brick stretcher-lengths square, with a recessed brick-wide panel in each side, constitutes the main height of the structure. There is ornate polychrome corbelled brickwork at the top, and what might be a squat chimney-pot.

There is nothing on the structure or in the surrounding grassland to offer any clues to the purpose of this structure. It may of course be no more than a column having, now, a lost significance. Or it may be a chimney or vent shaft, with an internal cavity presumably one brick square (that is to say, of the order of 0.2 x 0.2 metres). Immediately below this public open space is the disused and rather overgrown Cowgate Cemetery. Almost immediately below the shaft, in the back wall of the cemetery, can be seen three adjoining walled-up archways which, in 1990, appeared to have been quite recently repaired with new brickwork. This would be the likely location of an entrance to any cavity there may be below the 'chimney'. The majority of the graves nearby seem to be predominantly of the nineteenth century, with few if any noted later than the 1850s.

Staff at the Dover Museum, when consulted, could suggest no date or purpose for this enigmatic feature. Examinations of the interior of the adjoining Drop Redoubt have revealed no hints of passageways or stairs leading in the right direction to link with the structure.

Any thought of a prototype or experimental subterranean cremation furnace can almost certainly be dismissed! Cremation was illegal in England until a judicial ruling in 1884 to the effect that it was not an offence to burn,

rather than bury, a corpse, provided that no public nuisance was thereby created.

A society for the promotion of cremation had already been formed in 1874 under the presidency of the surgeon Henry Thompson [1820-1904], and England's first crematorium was opened in the 1880s at Woking. An average adult human corpse, in a modern crematorium, takes an hour to an hour and a quarter to be reduced to ashes without the emission of objectionable odours or smoke. Delivery of coal by way of pathways through Cowgate Cemetery would have been awkward, to say the least.

So members are invited to speculate, or even research, the purpose of this structure, which may or may not surmount a man-made cavity. It seems far too elaborate to have been made as a mortuary chapel, or even a cemetery watchman's hut, although before the Anatomy Act of 1832 much expense and ingenuity was devoted to protecting the departed from organised gangs of 'resurrection men' who made a living selling stolen newly-buried cadavers to medical students to practise surgery.

SMUGGLERS' CAVE AT ABERLADY, BETWEEN EDINBURGH AND NORTH BERWICK, SCOTLAND

Archaeological investigations of the supposed site of a rumoured 'smugglers' cave' by the Aberlady Conservation Society, assisted by the Grampian Speleological Group, have been reported. On 19 and 20 March 2009 trenches were dug at the site, and evidence was found to a dry-stone-wall-lined approach way about 0.5 metres wide.

However, there was not time to follow this sufficiently far to reach a linter or underground section, and the excavation was back-filled. Further work will call for substantial shoring. As a half-metre-wide passageway seems somewhat narrow for the passage of smugglers and their burdens, it has been suggested that the features seen may be traces of a *southern* associated with the nearby Iron Age fort, part of which has been lost to marine erosion.

SOURCE: YOUNG, Ivan, 2009, Smugglers' Cave, Aberlady. *Newsl. Grampian Speleological Group* 138, 9 – 10.

PREHISTORIC TO WORLD WAR I ARCHAEOLOGY AT THE OTTERBURN TRAINING AREA, NORTHUMBERLAND

The following two articles in a recent issue of *Current Archaeology* consider the conservation of archaeological remains of all periods, and the archaeological investigation of World War I practice trenches, on the Otterburn Training Area in Northumberland.

BROWN, Martin, 2009, "It's a long, long way to Tipperary" The archaeology of the Great War at

Otterburn. *Current Archaeology* 20(4)(232), 30 - 33 [Northumberland: Otterburn Training Area / archaeological investigation of practice World War I trenches]

WESTCOTT, Lisa, 2009, "From barrow to bunker: archaeology on the Otterburn Training Area. *Current Archaeology* 20(4)(232), 20 - 29 [Northumberland: Otterburn Training Area / includes location map and map of the Training Area]

NEWS – MILITARY AND DEFENCE

NOTTINGHAM RSG TO BE REDEVELOPED

A planning application for 475 homes has been submitted for the site of Government buildings and a nuclear bunker in Nottingham known as 'The Kremlin' the former Nottingham Regional War Room and RSG3.

The scheme, proposed by the Land Registry, would transform the 1950s site off Chalfont Drive, in the Leen Valley area of the city. The land is currently occupied by low-rise Government buildings, as well as the nuclear bunker.

Planners have been struggling with how to incorporate the concrete bunker into the development, as it must be retained since it is a Grade II listed building.

The outline application states: "The very minimum proposed for the bunker is that it should be made safe, that asbestos is removed from the internal areas of the building and sealed, and that any external damage should be repaired."

Four options have been put forward for the bunker. One included using coloured, back-lit Perspex screens to obscure it.

The favoured option, however, is to create a community garden and 'green wall' of foliage to soften the harsh contours of the Cold War building.

The application states: "This option was selected as it is considered the most appropriate way of creating a vibrant space, combining activity and community spirit with the need for open space.

"A landscape belt of up to 15 metres in width will be created around the bunker, with a 'green wall' established close to the building itself to soften its appearance."

The Land Registry is also investigating options for the use of the building, with one company interested in buying it for data storage.

The proposal, known as Orchard Park, suggests there is a desire to build family housing on the site.

A public consultation on the plans was held in early 2009 and around 800 people attended an exhibition, where proposals were explained.

Among the issues raised by the public were the impact of development upon the local services and concern about the long-term security of the bunker and its re-use.

Source: *Nottingham News* 6.8.2009

GERMAN AIR-RAID SHELTER TO BE PRESERVED

In Berlin a massive concrete air-raid shelter which Russian prisoners were forced to build as slave labourers in Berlin in 1943 is soon to be designated a historic monument as a reminder of the evils of the Nazi era.

The above-ground shelter, at the corner of Pallas and Potsdamer streets in the city's densely populated central Schoeneberg district, has for years been a grim World War II relic. It is adjacent to the site of the Palace of Sports, a city venue that was demolished in 1973.

At the Palace of Sports, Nazi Propaganda Minister Joseph Goebbels challenged an audience of Nazi Party faithful in 1943, 'Do you want all-out war?' The crowd rose to their feet and roared approval at his every word.

The speech, intended as a morale-booster for the nation, was made following the routing of the German Wehrmacht on the Eastern Front in the winter of 1942 and the expulsion of the Germans from Stalingrad by the Russians.

Built in 1910, the Palace of Sports was used for many political and sporting events between and after the two world wars. German heavyweight boxer Max Schmeling fought there several times. In the 1950s and 1960s, rock stars like Bill Haley, Jimi Hendrix and Pink Floyd showed up to perform there, but by 1973 its popularity as a concert hall had waned, and it was ordered to be torn down, leaving the shelter next door in isolation.

Local SPD politicians believe that by preserving the shelter, the horrific nature of war will be underlined for future generations of German citizens.

The grim-looking bunker was conceived as a shelter for up to 5,000 Berliners at the height of the 1939-45 conflict. Captive Russians forced to work on the project toiled in primitive conditions, their movements constantly monitored by gun-toting Nazi guards. One of the city's larger surviving wartime shelters, it has long been regarded as an eyesore by many Berliners.

The graffiti-smearred bunker today is 'framed' within a huge 1970s housing complex incorporating some 400 apartments in Pallas Street.

At the time, the post-war rationale for preserving the structure was that it could serve as a shelter for citizens in the event of a civilian emergency, or a surprise military attack on the city during the Cold War years.

But with the German capital reunited, such fears have long since faded. More recently, city officials have rented the bunker to the city's 'Underworlds Association,' founded twelve years ago.

Source: M & C Europe 13.5.2009

REDEVELOPMENT OF MISTLEY

Thirty homes could be built at the site of the former Mistley AAOR and Cold War museum in Essex. Developers Reliant Building Contractors bought the bunker at Furze Hill at auction for £350,000 in 2006 and

are now preparing a planning application for thirty three-bedroom houses on 2.1 acres of land at Shrubland Road. It is believed that the bunker itself will be retained although according to the owner it needs a lot of money spending on it which will come from profits made from the housing development.

In 2006 the firm said it would turn the northern section of the site into homes and moves were under way to have the bunker listed. An English Heritage spokesperson confirmed that to date the building has not been listed.

Source: *Harwich & Manningtree Standard* 5.6.2009

EXTENSIVE ‘BUNKER NETWORK’ DISCOVERED IN NORFOLK

In June 2009 an extensive bunker system was discovered in Waveney Forest, at Fritton in Norfolk, that is believed to be part of a top-secret World War II resistance base. Local residents firmly believe the network of 18 cramped holes was used by specially trained members of the Home Guard as a base to carry out sabotage operations against any German invaders.

Following the discovery and subsequent publicity half a dozen people have contacted the chairman of Fritton Parish Council to say they had evidence the bunkers were used by the so-called Dad’s Army commandos (Auxiliary Units).

Part of the evidence includes an obituary of a former Home Guard member who was based in the forest.

The parish council is collating all the information so it can be used in a dossier to persuade English Heritage to preserve the historic site. English Heritage says it had never seen a network of bunkers like it before and describes the find as a tremendous historical importance. It is hoped that if the bunkers are preserved it will stop potential plans to turn the woods into a quarry.

Source: *Lowestoft Journal* 16.6.2009

INDUSTRIAL ARCHAEOLOGY OF POST WORLD WAR II MILITARY SITES, UNITED KINGDOM

The Association for Industrial Archaeology’s Rolt Memorial Lecture for 2008 was delivered by Wayne Cocroft, whose theme was the creation and use of modern military sites, developing from World War II technology. Topics discussed include radar, jet and rocket engines, military and civil nuclear power etc. Particular consideration is given to aviation (the National Aeronautical Establishment at Bedford and the Gas Turbine Establishment at Pyestock); rocketry; nuclear weapons (Atomic Weapons Research Establishment at Foulness and Orford Ness); civil science; high-technology manufacturing; and associated housing.

SOURCE: COCROFT, Wayne D., 2009, ‘Dan Dare’s lair’ – the industrial archaeology of Britain’s post-war technological renaissance. *Industrial Archaeology Review* 31(1), 5 – 19.

NEWS – MINES AND UNDERGROUND QUARRIES

MINE REMAINS ON MENDIP HILLS, SOMERSET

Surviving mine shafts, timbering, and miners’ tools have been reported at Star Shaft on the Mendip Hills. The shaft was capped on 4 August 2006.

SOURCE: MOTH, Simon, David HOLMES, and Steve SHARP, 2009, Star Shaft. *Newsletter Chelsea Spelaeological Society* 51(6), page 76.

EAST COAST ALUM WORKS, 1604–1871, NORTH YORKSHIRE

The sea cliffs of North Yorkshire, and some nearby inland sites, were the most productive site of England’s alum industry from 1604 to 1871. Alum (ammonium or potassium aluminium sulphate) was manufactured from aluminous shales, and used especially in dyeing works as a mordant to ‘fix’ colours to cloth. Coastal erosion is causing the loss of much of the archaeological evidence for the extraction of alum shale and its conversion to ammonium or potassium alum. A recent survey of the physical remains of this industry has been reported. It is concluded that alum shale extraction was almost exclusively opencast, although there is slight evidence for some extraction by undermining, if not tunnelling.

SOURCE: JECOCK, Marcus, 2009, A fading memory: the North Yorkshire coastal alum industry in the light of recent analytical field survey by English Heritage. *Industrial Archaeology Review* 31(1), 54 – 73.

CARN BREA MINING SOCIETY BUYS GREAT CONDURROW MINE, CAMBORNE, CORNWALL

The Carn Brea Mining Society has purchased part of Great Condurrow Mine near Camborne, where copper and tin were mined from 1815 until the mine closed in 1881.

SOURCE: THORNE, Graham, 2009, Mining society buys Cornish mine. *Industrial Archaeology News* 149, page 11.

UNDERGROUND BUILDING-STONE QUARRY NEAR LANGTON MATRAVERS, ISLE OF PURBECK, DORSET

A visit to an underground building-stone quarry about a mile to the east of Langton Matravers has been reported.

It is to be regretted that this visit, during the course of which, reportedly, ‘no entry’ signs were ignored, an eight-foot-high wall was scaled, and greater horseshoe bats were noted, took place during the bat hibernation season, in February. All British bats are legally protected, and the horseshoe bats are an especially endangered species. Their survival is put at risk by disturbance during hibernation as, if they commence the process of arousal from hibernation early, they use up fat reserves needed to survive to the spring.

Winch stones and the unroofed remains of a stoneworker's workshop are reported at the quarry tunnel entrance. The slope shaft, with sled grooves, has a flight of steps beside it. The internal layout of the small quarry is indicated in an accompanying sketch plan, and interpreted as a result of two shallow slope-shaft quarries having access shafts at right angles to each other, with a short length of plain tunnel connecting them.

SOURCE: STEVENS, John, 2009, A Purbeck stone mine. *Newsletter Chelsea Spelaeological Society* 51(6), 76 – 77.

FIRE KILLS 36 ILLEGAL WORKERS IN DISUSED GOLD MINE, SOUTH AFRICA

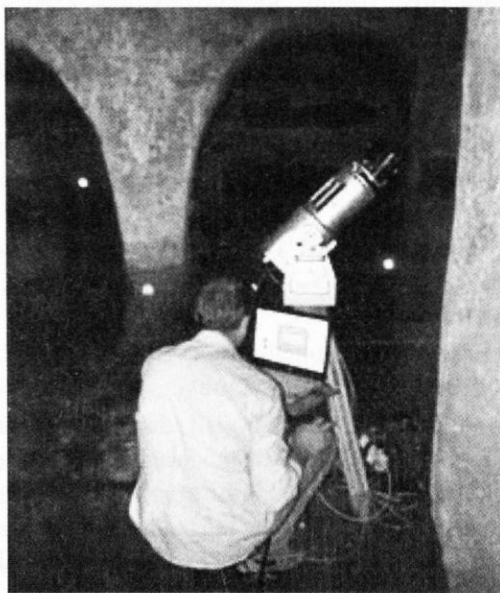
At least 36 illegal miners have been reported killed in a fire in the disused Eland shaft at a gold mine in Free State Province, South Africa. A similar fire at the St Helena mine killed 23 illegal workers in 2007. Both mines belong to Harmony, the world's fifth largest gold producer. Illegal miners are able to bypass security guards as adjoining active and disused mines, owned by different companies, are sometimes connected underground.

SOURCE: ANON, 2009, Fire kills 36 illegal workers in disused gold mine. *The Guardian*, 2 June 2009, page 17.

NEWS - MISCELLANEOUS

MAPPING ROME'S CATACOMBS

A major project is being planned to map 105 miles of catacombs beneath Rome. The leader of the project, Dr Norbert Zimmerman of the Vienna Academy of Sciences, was behind the idea to use laser scanners to record every part of the Catacombs. His scanner, which looks like a cylinder on a tripod, stands a metre or so



high and is a piece of kit you usually find in the construction industry.

The scanner has been placed in hundreds of different locations in the Catacombs. It turns slowly, sending out millions of light pulses that bounce off every surface they

come into contact with. The light pulses rebound back into the scanner and are recorded on a computer as a series of white dots, known as a "point cloud". Gradually every wall, ceiling, and floor is bombarded with the dots, enabling the computer to build up a picture of each room. When the process is finished, it looks like an actual film of the particular room in question. In all, four billion dots were recorded, enabling practically the whole catacomb to be documented in this way. Only a handful of small spaces were left out because it simply was not possible to get the scanner in.

The final result is astonishing. The catacombs of Saint Domitilla stretch for about 15km (9 miles). On a computer screen, you can now see the whole underground complex. Using different buttons on the key pad, you can zoom in on the tunnels. You can travel "through" walls, down corridors and into chambers, giving the first real sense of their beauty, scale and detail.

Paintings on walls, which have not been seen in nearly 2,000 years, are now visible - their colours vivid and clear. "It is not a virtual image, it is not animation - what you are seeing is real data," says Dr Zimmerman.

Source: BBC News 3.5.2009

WORLD'S LARGEST CAVE

A British caving team believe they have discovered the world's largest cave passage in the heart of the Vietnamese jungle. Called Hang Son Doong (Mountain River Cave) it is believed to be almost twice the size of the current record holder.

'It is a truly amazing sized cave and one of the most significant discoveries by a British caving team,' said Adam Spillane, a member of the 13-man expedition team.



The cave was originally discovered in 1991 by a Vietnamese 'Jungle man' but nobody would enter it because "it emitted a frightful wind and noise which was due to a large underground river".

Assisted by representatives of Hanoi University of Science, the joint British-Vietnamese Caving Expedition 2009 spent five days exploring the cave in Phong Nha-Ke Bang National Park in mid-April. The team spent six hours trekking through the jungle to reach the cave. Climbing down into a large chamber, they had to negotiate two underground rivers before reaching the main passage of the Hang Son Doong which is 150 metres long and measures a towering 200 metres in height.

The team will return to Vietnam later in the year to complete the expedition of the cave and conduct a full survey. The cave is 6.5km long at present but the end of the main passage still continues with a calcite wall of over 45m high halting further progress.

Source: *Daily Mail* 5.5.2009

A CHINESE FARMER DUG A 50FT HOLE IN HIS HOUSE TO GO FISHING

Li Huiyan, of Chongqing, hired 30 villagers for six months to dig the hole in his kitchen. He wanted to reach an underground river which he suspected was full of fish.

The river had been overground but had disappeared 30 years ago when the local authorities bombed part of a mountain to pave a road.

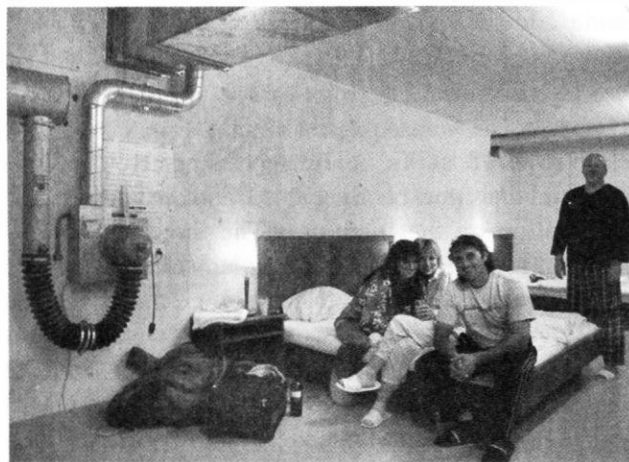
Source: IC Media



PRICES SLASHED AT WORLD'S FIRST 'NO STAR' HOTEL

Economic gloom across Europe has seen the world's first 'no star' hotel slash its rates to £5.99 a night. The bargain price buys a room with no windows or television, no central heating, very little hot water, and a compulsory waking time of 7am.

Guests are likely to have to share their room with up to six lorry drivers, hard-up travelling salesmen or passing immigrants, and must queue for the hotel's one shower in the morning.



Designed by conceptual artists, it was opened to the public earlier this summer as the ultimate in no-frills luxury. Much of the hotel is built underground, meaning it can be cold even in the middle of a hot summer, so the hotel offers hot water bottles to keep guests warm.

However, while the establishment does not offer many amenities usually associated with hotels, it does offer one unique feature. The hotel is built in a disused nuclear bunker - a relic of the Cold War - so guests are guaranteed safety in the event of an atomic explosion.

Source: *Daily Telegraph* 3.7.2009

THE DOOR TO HELL

In 1971, during drilling for natural gas in Darvaza, Turkmenistan, the ground on which the drilling rig was placed collapsed, leaving a large gaping hole exposed with a diameter of around 60 metres. To avoid poisonous gases coming out of the hole, it was decided to let the gases burn. As of 2008, gases in the underground cavern are still burning without interruption. Locals have named the cavern 'The Door to Hell'.

INSTITUTE EUROPA SUBTERRANEA – THE NETHERLANDS, BELGIUM, and GERMANY

During the 2008 Société Française d'Étude des Souterrains congress at Amiens we met John Van Schaik, of Maastricht, and a colleague, representing Institute Europa Subterranea, an organisation advertising itself as having roots in Maastricht (The Netherlands), Brussels (Belgium) and Reichelsheim (Germany). We had, despite longstanding connections with Maastricht, not previously come across this body. Some 'expression of interest' postcards were distributed, which declare its sphere of activity to be in 'research, consultancy and education on archaeological mining history.'

The postal address is: Institute Europa Subterranea, Akerstraat 14-C, NL-6221- CL Maastricht, The Netherlands. Curiously, no email address or website details appear.

The *Times Atlas of the World* has two small places in western Germany called Reichelsheim: one is about 27 km north of Frankfurt am Main, the other about 25 km southeast of Darmstadt. Akerstraat appears to be the

home address of Jacquo Silvertant, of 'Silvertant Enterprises', in Maastricht.

A copy of the proceedings of the '3rd International Symposium on Archaeological Mining History', held 9 to 11 May 2008 at Valkenburg, Kanne-Riemst, and Maastricht has now been received, and contains further information on the Institute. The three conference locations are all at or near Maastricht, Valkenburg being a small town to the east of the city, and Kanne-Riemst a small local authority area just over the border in Belgium. The 'Governing Board' is stated to comprise John R. Van Schaik and Jacquo Silvertant of the Netherlands, Jochen Babist of Germany, and Luc Stevens of Brussels, Belgium. Luc Stevens is a leading member of our sister-society in France, the Société Française d'Étude des Souterrains.

The Institute is stated to have been founded in 2007, following international meetings at Reichelsheim in 2006 and Freiberg in 2007, both in Germany. It 'hopes to become a central point for mining historian, mining archaeologists .. [. ..] with 'European Union support.' Presumably 'Europa' is intended to signify the historical and cultural continent, not to some more restricted economic or political grouping of countries.

The Symposium Proceedings, noted above (to be reviewed in a future issue of *Subterranea*) contains the following:

INSTITUTE EUROPA SUBTERRANEA

The Institute's Goals

To support and stimulate border crossing scientific research on the meaning of underground cultural landscapes and mining historical heritage.

Composing a scientific program for research, publication and advice.

To promote the participation of individual research institutes and researchers in international panels and cooperative groups involved in mining historical research. Publishing scientific and popular books, articles and multi-media productions.

To promote the funding of research and publication and also the interests of European authorities and organisations which are active in this field,

Actively sharing the experiences, lessons learned, methodologies and best practices the Institute obtains during its cooperation with colleague organisations and individuals.

To stimulate and promote the European exchange of knowledge and expertise on underground cultural landscapes.

The opening of an exhibition space.

To contribute to a broader European perspective of connecting and integrating natural and industrial heritage with each other.

The Institute tries to achieve these goals by

Organising and promote exhibitions about mining historical subjects.

To advise European institutions, organisations and individuals that are actively involved in the preservation, conservation, protection and use of underground cultural landscapes.

The contribution to exhibitions by third parties.

The organisation of international Symposia.

Execution of educational programs for schools and social organisations.

Building a network of people who are actively involved in dealing with underground cultural landscapes.

This is all somewhat reminiscent of, although more ambitious than, the short-lived Institute of Mining History and Archaeology which brought together British mining archaeologists and historians for academic-level conferences in the early 1990s.

It remains to be seen whether the new Institute will extend its formal links beyond the present three countries, to include, say, France or the United Kingdom. [Paul W. Sowan]

CLOSURE THREAT, SCOTTISH MINING MUSEUM, NEWTON GRANGE

Major repair work is needed at some of the buildings at the former Lady Victoria Colliery at Newton Grange (south of Edinburgh), now the Scottish Mining Museum. Funding is problematic: both the local council and Historic Scotland have recently reduced their financial contributions. Closure of the museum was contemplated. Fortunately, the Scottish Government has now announced that it will make available £ 1.4m of emergency funding, towards the estimated £ 2.5m needed for building repairs. SOURCE: ANON, 2009, Emergency funding for Scottish Mining Museum. *Newsl. Grampian Speleological Group* 138, page 10.

FORTRESS STUDY GROUP

The Fortress Study Group was founded in 1975 'to represent the interests of those actively involved in the study of all aspects of fortifications and their armaments, especially works constructed to mount and resist artillery'.

The Group publishes a newsletter, *Casemate*, and a substantial journal of high quality (in terms of content as well as of production) called *Fort - the International Journal of Fortification and Military Architecture*. Substantially complete files of both titles are maintained and continued by our former Chairman Paul Sowan, a FSG member.

MAN EVICTED FROM HIS OWN CAVE, BRIGHTON, SUSSEX

A man has been evicted from an artificial cave which he had excavated for himself. Hilaire Purbrick, the excavator and inhabitant, had lived self-sufficiently in the 'cave' on a Brighton allotment for the last 16 years.

The 'cave', seven feet (2.15 metres) long, was inspected by the local fire brigade, and condemned as a dwelling on the grounds that it had no emergency fire exit! Brighton & Hove City Council obtained a possession order for the plot of land, facilitating the man's formal eviction. He has pointed out that many larger and more conventional dwellings have no alternative exit, and plans to appeal to the European Court of Human Rights.

SOURCE: ANON, 2009, Caveman's angry exit. *Daily Telegraph*, 18 June 2009, page 3.

DEATH OF ANDREW SAUNDERS [c. 1932 – 2009]

The death, on 13 March 2009, of Andrew Saunders, aged 77, has been announced. He was an Inspector of Ancient Monuments (from 1954) and a founder member of the Fortress Study Group in 1975.

SOURCE: ANON, 2009, Obituary [Andrew Saunders] *Casemate* 85, pages 6 and 25.

NEWS – PERIODICAL PUBLICATIONS

ARCHIVE 62 – JUNE 2009

This issue contains, *inter alia*, the following items of potential interest to SB members ...

ANON, 2009, Brookes Ltd. *Archive* 62, page 46 [Yorkshire: Halifax: two photographs of Brookes Ltd's Lightcliffe Works / the firm owned and worked quarries and worked stone / their Lightfield Works were rail-connected – the stone-dressing works closed in 1969]

MOUNTFORD, Colin E., 2009, Burnhope Colliery and village. Part 3. 1900 - 1939. *Archive* 62, 18 - 32 [Co. Durham: includes Ordnance Survey plan extracts showing rail lines / tramways, drifts, shafts, quarries, and a brickworks / also a 1933 plan of Annie's Pit (Bottom Bushy Seam) including a furnace shaft, an underground engine-house and boilers, and the location of an underground fire in 1933]

POPE, Ian, 2009, Port Dinorwic. *Archive* 62, 54 - 64 [North Wales: Llanberis slate quarries tramway of 1824 partly on inclined plane within a short tunnel under a road / Padarn Railway of 1843 / subsequently a steam-worked alternative line dating from 1848 / there was also a siding from the Bangor & Caernarvon Railway of 1852 / Padarn Railway closed in 1961 as did the quarries in 1969]

NORTHERN MINE RESEARCH SOCIETY NEWSLETTER – MAY 2009

The May 2009 issue contains, *inter alia* ...

ANON, 2009, Hudeshope meet. *Newsl. Northern Mine Research Soc.*, May 2009, 3 – 4 [Durham: Teesdale]

CALLENDER, R., 2009, Treasure trove: the new code. *Newsl. Northern Mine Research Soc.*, May 2009, 6 - 8 [New law effective within Scotland]

GILL, Michael, 2009, Deaths at Threshfield Colliery. *Newsl. Northern Mine Research Soc.*, May 2009, page

10 [Deaths of Thomas Paley (49) and Richard Latham (14) on 22 November 1873]

SAVINE, Fiona, 2009, Appeal for help from a post-graduate student of landscape archaeology. *Newsl. Northern Mine Research Soc.*, May 2009, page 8 [Lead-mining landscapes in Arkengarthdale and Swaledale]

SUTCLIFFE, Barbara, 2009, Geevor tin mine, Pendeen, near Penzance, Cornwall. *Newsl. Northern Mine Research Soc.*, May 2009, 10 – 11.

SOCIÉTÉ FRANCAISE D'ÉTUDE DES SOUTERRAINS - SUBTERRANEA 148

Our sister society in France publishes a periodical entitled, like our own, *Subterranea*.

Issue 148 contains, *inter alia*, the following:

DEVOS, Alain, Christelle SOSSON, and Olivier LEJEUNE, 2008, Les carriers Souterraines de Glennes (Aisne – 02), *Subterranea* 138, 110 – 118 [Underground building-stone quarries near Soissons with World War I graffiti]

DOURVERT, Hugues, 2008, Un aqueduc dans la forêt de la Montagne Thiernoise (63), entre le col de la Plantade et le col Saint Thomas. *Subterranea* 138, 119 - 125 [Aqueduct near Thiers / Puy-de-Dôme]

FERRARI, Bertrand, 2008, Quelle "muche" les donc piques? *Subterranea* 138, 105 - 108 [Cavities excavated in the chalk (*muches*) interpreted as refuges or granaries]

RALLON, Marcel, 2008, Hypothèse sur l'origine des souterrains refuges. *Subterranea* 138, page 109 [Suggests that subterranean refuges were excavated in advance of invasion]

STEVENS, Luc, 2008, Assemblée Générale de la Société Française d'Étude des Souterrains tenu à Amiens le 28 octobre 2008. *Subterranea* 138, 103 - 104 [Report of Annual General Meeting]

STEVENS, Luc, 2008, La 31^{ème} congrès de la SFES - Amiens 18- 19 octobre 2008. *Subterranea* 138, 98 - 102 [Report of 31st Congress of Société Française d'Étude des Souterrains at Amiens]

NEWS - TUNNELS

WESTMINSTER CCTV SURVEILLANCE SYSTEM, PICCADILLY CIRCUS, LONDON

The London Borough of Westminster's underground CCTV Control Room lies below Piccadilly Circus. A recent feature article in *The Guardian* describes a wall of 48 CCTV monitors linked with 160 fixed surveillance cameras on central London's streets, and an additional number (cited as 'dozens') of mobile cameras. Most images are stored for 31 days – some for an unspecified longer period.

As predicted by George Orwell in his book *1984*, we are all being watched! And 'deviant' behaviour is monitored; it is not long since newspapers reported the case of 'suspects' (who happened to be bus enthusiasts)



apprehended for photographing a suburban bus garage! Presumably, numerous images of members of Subterranea Britannica are on file, given their interest in things underground.

It has been estimated that there are at least 4.8 million public surveillance cameras installed in the UK. We have more such cameras per head of the population than any other country. And it seems that the rest of the world wants to catch up. More than 6,000 officials from 30 countries have visited the control room under Piccadilly to acquire expertise in surveillance. Some of the countries represented might be considered to have somewhat dubious human-rights records!

SOURCE: LEWIS, Paul, 2009, Every step you take: UK underground centre that is spy capital of the world. *The Guardian*, 2 March 2009, page 13.

CENTENARY OF ROUTE-SHORTENING TUNNEL ON THE NEW RIVER, LONDON

The New River was a seventeenth-century water supply scheme for London, originating with the City obtaining Acts of Parliament in 1606 and 1607. These enabled the cutting of a four-mile channel from springs at Amwell to Chadwell (both in Hertfordshire), eventually extended to deliver water to a round pond at New River Head, Clerkenwell.

The work, at first financed by Sir Hugh Myddelton [c.1560–1631], commenced in 1608. The completed route ran for about 38.75 miles, approximately following the 100-foot contour, to allow water to flow entirely by gravity. The channel, about ten feet wide and four feet deep, was necessarily somewhat sinuous (a direct route would have been about 20 miles) and on that account was unpopular with landowners whose fields were severed.

In the mid-nineteenth century the route was shortened by making channels to eliminate some of the curves. This work included the making of a half-mile tunnel, opened in 1859, from Myddelton Road to Station Road, Wood Green.

SOURCES: David FLETT, 2009, New River tunnel anniversary. *Newsl. Greater London Industrial Archaeology Society* 242, page 5; *Dictionary of National Biography* XXXIX, page 436; and Ben WEINREB and Christopher HIBBERT, 1983, *The London Encyclopaedia*, pages 558 – 559 [New River Company] and 953 – 959 [water supply]

CROSSRAIL - LONDON

Seventeen firms have been selected to carry out site facilities, demolition, civil engineering, and utilities works in connection with the construction of the intended Crossrail east-west tunnel link under central London.

To minimise disruption in London's streets during the construction of the tunnel, the civil engineering plans have been revised, with the elimination of eight of the originally intended access and/or permanent ventilation shafts on

the line. Additional cross-passages linking the tunnel's two running tunnels will be provided to maintain required ventilation levels. A consequence is that less property will now need to be demolished at the surface.

The formerly intended shaft location sites were at Westbourne Bridge W2, Hyde Park W2, Park Lane W1, Hanbury Street E1, Lavell Street E14, Hertsmeare Road E14, Blackwall Way E14, and Warren Lane E18.

SOURCE: ANON, 2009, Access shafts cut from Crossrail plans, easing surface disruption + Crossrail chooses 17 for enabling works. *Modern Railways* 66(728), page 8.

HEATHROW AIRPORT'S NEW BAGGAGE TUNNEL, LONDON

London Heathrow Airport has a new luggage-handling system in course of construction, including an almost 6m diameter tunnel bored for 2.4 km through London Clay. The 14 million tonnes of clay spoil will go to landfill sites. The tunnel, running at a depth of 39 metres underground, will link Terminals 3 and 5, pass below runways and aviation fuel storage tanks, and skirt the Piccadilly Line tunnels. At a tunnelling rate of the order of 15 metres a day, the tunnel is expected to be completed (including fitting out) for use by 2011. The new system is designed to reduce baggage inter-terminal transit times (currently of the order of an hour and a half) by 20 minutes.

SOURCE: Stephen BATES, 2009, Tunnel vision: Heathrow's new luggage system. *The Guardian*, 29 April 2009, page 8.

NATIONAL GRID 400kv CABLE TUNNEL BREAKTHROUGH BELOW LONDON BOROUGH OF CROYDON

Electricity pylons being unpopular through town centres, an important electricity supply route across Croydon has for some considerable time been accommodated by oil-cooled cables below roads. These, nearing the ends of their useful lives and having no provision for additional capacity, are now being replaced by a 10km cable tunnel linking a substation on the LB Bromley border, below central Croydon, to another substation at Beddington in LB Sutton close to the site of the former Croydon B Power Station.

Apart from shafts at the terminal substations, there are two more – for spoil extraction at the south end of Kent Gate Way (A 2022) and for access close to the Lloyd Park stop on the Croydon Tramlink at Coombe Road (A 212). The tunnel, driven by tunnel-boring machines entirely in chalk, has now been completed, and is now being fitted out with provision for pumping (in case it is needed) and ventilation and, of course, cable laying.

In the neighbourhood of Coombe Lane and Oaks Road this new tunnel passes (at a much lower level) the location of some probable medieval deneholes (early shallow chalk mines) and some artificial 'caves' (now lost) said by John Aubrey [1626-97] to have been dug by William



Harvey [1578-1657] which gentleman (the discoverer of the circulation of the blood) is said to have liked to sit in the dark to contemplate.

SOURCE: ANON, 2009, Tunnel breakthrough marks key stage in massive electric project. *Croydon Advertiser*, 1 May 2009, page 3.

STROUDWATER CANAL AND SAPPERTON CANAL TUNNEL RESTORATION, GLOUCESTERSHIRE

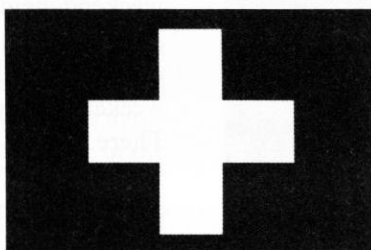
British Waterways has pulled out of a scheme to restore the Stroudwater Canal, leaving Stroud District Council as the lead authority for the project, which has Heritage Lottery Funding of around £12m. Phase 1A of the scheme has priority, for the canal extending from Stonehouse to Brimscombe Port, about three miles southeast of Stroud (further up the canal in the London direction). At a later stage, possibly, restoration of the 3810 yards Sapperton Canal tunnel, built 1783–1789, is envisaged.

SOURCE: ANON, 2009, Stroudwater Canal restoration. *Industrial Archaeology News* 149, page 13.

BRITISH TUNNELLING SOCIETY: UK TUNNELS DATABASE

The British Tunnelling Society (an organisation for professional civil engineers concerned with tunnelling) has launched an online database of British tunnels. At present some 200 tunnels of all kinds (including cable, metro, railway, road, and sewer tunnels) constructed between about 1950 and 2000 are included: more are to be added. Twenty-six attributes are given for each tunnel, including details of geology, dimensions, and references to published information. The database is at: <http://www.britishtunnelling.org.uk/database.php>

SOURCE: BRITISH TUNNELLING SOCIETY, 2009, New tunnel database. *Newsletter Chelsea Speleological Society* 51(5), page 53.



First Aid Training for Sub Brit Members

Linda Bartlett

As leaders of Study weekends to various parts of the UK and France, Martin and I thought it would be a good idea to bring our First Aid skills up to date. We found a very useful two-day course run by St John Ambulance called 'Activity First Aid'.

With Committee agreement, we attended the course at our local St John HQ in Camberley – it cost £65 per person. The course misses out the tedious stuff about work-place accident books and form filling-in, and instead gives you the basics on emergency life support and First Aid for accidents and sudden illness. On top of this, we learnt about how to manage casualties outdoors, how to cope with extremes of temperature and the role of the first aider in a group setting.

I was a bit apprehensive at first, but we soon got to know the other people in the group. We were all there as the whole class was going to be in similar group/outdoor situations to ourselves – one was planning to lead Ramblers Holidays; one was the skipper of trips for the disabled and elderly on canal boats; one taught rugby lessons for kids; one was a teacher and the last two chaps were mountain climbers and leaders.

About half the course was lectures and half was practical – practising giving CPR (Cardio-Pulmonary Resuscitation), practising putting on bandages and splints and patching people up. It did a lot to boost our confidence. We were also able to check that the Sub Brit First Aid kit had all the correct equipment.

For more info see <http://www.sja.org.uk/sja/training-courses/courses-for-the-general-public/activity-first-aid>. The website is quite nifty and shows chosen courses by distance from your town or postcode.

We'd like to encourage more members of Sub Brit to have good First Aid skills – particularly if you are a frequent attendee at Sub Brit events or are leading one of Sub Brit's or your own trips.

We discussed this at the last committee meeting and agreed that Sub Brit would fund half the cost of the training course (subject to the number of applications!). If you would like to get trained, then please email us on info@subbrit.org.uk. We'd ask you to arrange your own course through St John, and then refund you up to £35 on successful completion.



Fancy finding out more about Mining? - Then get hooked into 'NAMHO'

Linda Bartlett

Subterranea Britannica encompasses the study of all man-made or man-used underground structures; worldwide, mining probably produces more underground space than any other activity.

Introduction to NAMHO

If your interest extends to exploring Britain's wealth of mines, then there is an annual underground weekend which may be of interest to you. NAMHO (National Association of Mining History Organisations) is an organisation whose members are other organisations – Sub Brit is a member, and we try to send a rep (usually Paul Sowen) to most council meetings. So, as a Sub Brit member, you are already automatically a member of NAMHO. This year, NAMHO celebrates 30 years as an organisation.

NAMHO arranges a weekend once a year, to which members of all participating organisations are invited, which is a chance to do some more exploring underground. There were quite a few Sub Brit members at this year's event in Matlock, Derbyshire – myself (Linda Bartlett), Martin Dixon, Sue Monsell, Lyndon Cooper, Mike Moore, Ken Geddes and Roger & Sally Gosling were the ones we spotted. There may have been more that we didn't see, as not everyone does all the same events. Many of the above are also members of other groups who are part of NAMHO.

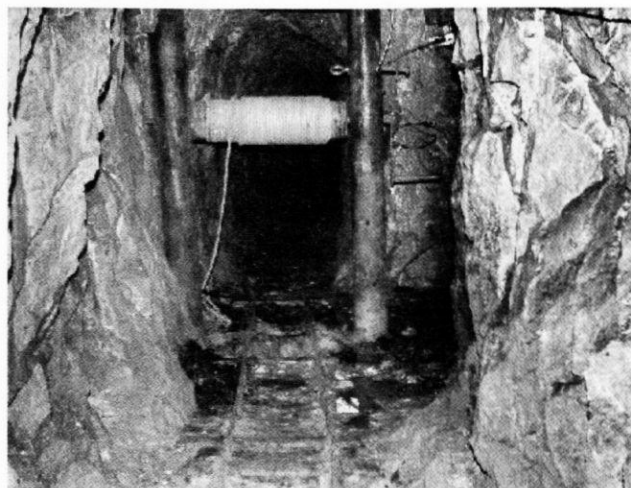


Good Luck Mine adit

Photo from Goodluck Mine website by Richard Platt

The NAMHO weekend

This year's weekend was arranged and coordinated by one of NAMHO's founder-member groups – PDMHS (Peak District Mines Historical Society – see <http://www.pdmhs.com>), themselves now 50 years old. Why didn't I know about it I hear you cry? Well you did actually, it was in the Diary at the front of this magazine and there was an email to the List, but perhaps you didn't know what NAMHO was.



Winch in Good Luck Mine

Photo from Goodluck Mine website by Richard Platt

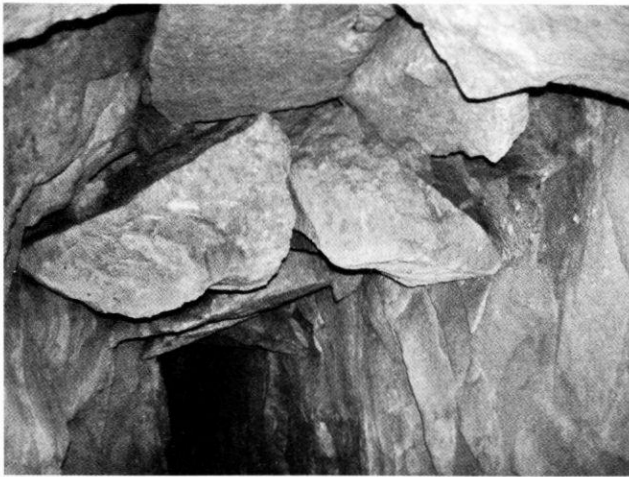
Nearly 200 people attended this year's NAMHO weekend, held between Friday 19 June and Monday 22 June. That's a lot, I hear you cry – wasn't it a bit crowded? Well, no it wasn't actually – as the NAMHO weekend has an interesting way of arranging their events. There are several activities running in parallel: on Saturday and Sunday, there are a series of lectures; on each day Friday to Monday, there are underground and surface visits, and each evening there is a dinner. All levels are catered for, from SRT into Titan to walk-in visits. What's more, you can book on each of these events separately (through the website) – so you can tailor your weekend to suit what you fancy doing. Thus for example, of the Sub Brit people, Roger & Sally attended the lectures; Sue chose to go down the muddy, wet holes and the others chose different trips to us.

Goodluck Lead Mine

We arrived late on the Friday evening, and caught the tail end of the cold buffet (very nice) and the slide shows in Matlock's County Hall (very grand). It was nice to chat with the other members of Sub Brit over a beer – some we had seen recently on the French weekend, others we hadn't seen for a while.

On Saturday morning Martin and I chose to go down the Goodluck Lead Mine, just outside Matlock. There were 14 of us on the visit in two groups down the mine, so it was nicely uncrowded – but the mine passages are very small so it was a good job we were a small group! The mine dates from the nineteenth century and the miners were chasing a vein that had been profitably exploited from the surface higher up the hillside.

Sadly the mine never lived up to its optimistic name and despite working through very tough limestone rock, the records and remaining evidence show only very thin veins of lead ore were ever uncovered. The ore was galena, or lead sulphide. The miners were always hoping to find



Distinctive 'herringbone' roofing in Goodluck lead mine
Photo by Martin Dixon

a thicker band, to make their efforts more profitable. Veins with as low as 2% galena were sometimes profitable when prices were high but Goodluck was always at the margins.

The entrance to the mine was closed by blasting by the landowner in the 1950s but reopened by enthusiasts in the 1970s. Today the mine is supported by a small but active group (<http://www.goodluckmine.org.uk/>) who got permission to run small-scale tours just two years ago. There are some nice displays throughout the mine of the artefacts which have been found – old bottles, shoes, minerals, the rails for the tubs of ore and the remains of a winch. The roof of the passages was mostly formed with 'herringbone' pattern supports, cut into small notches in the passage side and complete with miniature chock stones. Some members of the group extended the trip with a crawl and then a climb up an original chain ladder. All in all a very enjoyable hour and a half.



Holmebank Chert Mine, remains of vertical roller in main haulway - Photo by Martin Dixon

We came out in brilliant sunshine, and then made our way to the afternoon visit on the outskirts of Bakewell – you need your own transport to get to the sites, which made the parking a bit tricky at Holmebank Chert Mine. We did have a chance to stop in Bakewell for our lunch and sample the local Bakewell Pudding (different to Bakewell Tart and even more yummy!).

Holme Bank Chert Mine

Chert is chemically similar to flint, being a microcrystalline silica but it is found in limestone bedrock rather than chalk. It most often occurs in nodules but near Bakewell is found in sizeable beds. The main use of chert is for grinding the flints used to give bone china its strength. Extracting the chert underground (which came in beds up to 16 feet thick) was done by undercutting the softer limestone beneath them.



Unusual 'two seat' toilet in Holmebank Chert Mine
Photo by Martin Dixon

The chert bed was supported using timbers or rocks and when this was ready for dropping, the supports would be either pulled or blown away and more often than not the chert would drop under its own weight. In some cases a round of charges had to be set above the chert bed to bring it down. Once down, it would be cut to the desired size by using plug and feathers. Later in the mine's life, the waste limestone 'deads' were used to make breeze-block-like 'Davy Blocks' for the building industry. Chert mining finally ceased in Bakewell in 1968.

We walked up to the mine entrance, dressed in underground gear, and shooed lots of puzzled sheep away from the entrance to the mine – they looked like Borrowdale Greybacks. It was a bit of a scramble down a barrel-lined entrance, but once inside, the passages were at least seven feet square and we had lots of headroom. The deads had been stacked behind particularly fine dry-stone walls.

We made our way to the working face where we could see blocks of chert just as the miners left them; supported on small rock supports, the beds were almost ready to be dropped – a fascinating preservation. We then continued our journey through the almost two miles of passages,



Typical gallery in Holme Bank Chert Mine

passing old tubs, drill heads and extensive rail tracks. We eventually 'bottomed out' in the sump where the water table has risen to flood the lower workings. This was crystal clear and is used today for cave diving training. We exited via a lower entrance after what had been a first rate, well guided two-hour through trip.

Sunday – a gentler day!

On Sunday, we attended the morning series of lectures on the history and future of mining museums. This took place at the Pavilion in Matlock Bath – a stunning building and an excellent museum, now run by PDMHS. We were then treated to a lovely buffet lunch, hosted by PDMHS and celebrating the two anniversaries before we shot off to Youlgreave and Alport.

We had a lovely afternoon in Youlgreave, doing a surface walk guided by Tony Wood, one of the PDMHS members. Equipped with a map of the veins, shafts and soughs, he explained all the visible remains of Lead Mines in and around the two villages. We got to look down one of the deepest shafts – capped with a grille - and dropped some of our drinks into the water many feet below (mustn't chuck pebbles in!).

By coincidence we bumped into Sue, peeking a look at the Well Dressings in the village. She was having an

The Limestone Mines at Dudley and Walsall in 1895

The South Staffordshire Mining Inspection District, in 1894, included parts of Staffordshire and Worcestershire, along with Essex, Norfolk, and Suffolk. The only reported East Anglian mine operating that year was the flint mine at Brandon, Suffolk. The remaining six mines in the District which came under the Metalliferous Mines Regulation Acts of 1872 and 1875 were in Silurian limestone in and around Dudley and Walsall in the Black Country.

The seven mines together employed five males aged 12 to 16, and 164 males over 16 underground. Above ground there were three males aged between 13 and 18 at work, and 68 older than 18. During the year 82,352 tons of limestone were raised (in the Black Country), and 73 tons of chalk and 115 tons of flints (at Brandon.)

There were three notifiable accidents, all in the limestone mines, reported in the following terms ...

afternoon off, having spent the morning going through Magpie Sough (the drainage channel for Magpie Mine) – and then floating out on an airbed!

Our NAMHO experience came to an end in the evening when we joined over 100 of the attendees at a splendid Barbeque at Magpie Mine – a local lead mine whose surface remains have been 'rescued' by PDMHS. It was a fantastic warm evening, with the sun still shining as we munched our way through sausages, chops, lamb skewers, corn on the cob and salads – washed down with a few pints of beer from the barrel and finished off with a slice of gateau. Our PDMHS hosts had done themselves proud in hosting a splendid weekend.

We opted out of the Monday visits as we had to get back home – there were still more visits to choose from.

NAMHO 2010

And now a plug for next year's weekend which will be held on 4 - 6 June 2010 based near Bristol and Bath. It will be hosted and organised by the South Gloucestershire Mines Research Group (SGMRG), Friends of Ram Hill Colliery and Hades Caving Club. Roger Gosling (a Sub Brit member that many of you may know) also belongs to SGMRG and will be helping to organise the weekend. Some of the sites will be similar to those that Sub Brit visited on our Study Weekend in 2006 (e.g. Bath Stone Mines, Redcliffe 'Caves' sandstone mines and Clifton Rocks Railway) and others we didn't visit further afield like mines in the Mendips and the Forest of Dean.

So there should be something for all members of Sub Brit – if you came to Sub Brit's 2006 weekend there will be different sites for you to explore; if you missed the SB 2006 weekend or are new to SB – well you have a second chance to see those sites. Or you can take a gentler approach and listen to a fascinating lecture programme – or you can mix and match.

You should be able to book from 1 January 2010 onwards – keep an eye on the website:

<http://www.namhoconference.org.uk>

In the Hatherton limestone mine, Walsall, a boy of 15 years of age retreated so slowly when the word was given to "Fire", that he had his arm broken by a piece of projected rock. Fortunately for him, the three succeeding shots missed him.

A stone-getter in the Wrens Nest mine near Dudley, was injured on the 18th September by a fall of rock from a height of 30 feet.

The other injury was only trifling.

Scott's report for the previous year had commented that 'The trade of limestone mining has felt the pinch of hard times, for the output was reduced.'

Reference

W. Beattie Scott, 1896, *Report of H.M. ... H.M. Inspector of Mines for the South Staffordshire (No. 11) District ... for 1895*. HMSO [C. - 8074] 22pp [pages 18 - 19]



Camden Town's Rich Railway Heritage

Peter Darley

1. London & Birmingham Railway

The London & Birmingham Railway (L&BR) was London's first main line and the largest civil engineering project yet attempted in the country. It was the first railway of any length, and the first that really changed the travel and commercial habits of the British people. The experience gained formed the basis of much of the general development of civil engineering in Britain and established the construction technology of the railway age. It also precipitated the railway mania of the 1840s.

Our focus is on features in the area bounded by Regent's

Park Road, Primrose Hill Road, Adelaide Road, Chalk Farm Road and the Regent's Canal, all of which fell into the Primrose Hill contract, and on the links between this area, which included the Camden Goods Depot, and the passenger terminus at Euston. The map shows this area. The line with numbered points relates to the proposed Railway Heritage Trail.

Robert Stephenson, son of George Stephenson, was appointed engineer-in-chief for the whole line in September 1833. He was not yet thirty. The first sod was cut at Chalk Farm on 1 June 1834. Difficult ground conditions on the Primrose Hill contract, including the tunnel and deep approach cutting, bankrupted the contractor. The work had to be taken over by the company using direct labour.

In late 1834 the Company applied for an extension from Camden Town to allow passengers to reach Euston. The extension to Euston Grove, beside the New Road (now the Euston Road), was authorised on 3 July 1835.

The Regent's Canal had to be crossed at a height that allowed boats to pass below; the ground at Camden Depot therefore had to be raised about 13 feet, while that at Hampstead Road and six other road crossings had to be lowered for rail tracks to pass under the roadways.

Stationary winding engines, housed in vaults beneath the rail tracks, pulled the trains up the Camden Incline from Euston to Camden Town. Later railways in the Camden area were to avoid the steep gradient imposed by the Canal either by going under it, as at King's Cross, or by raising the rail terminus on arches, as at St. Pancras.

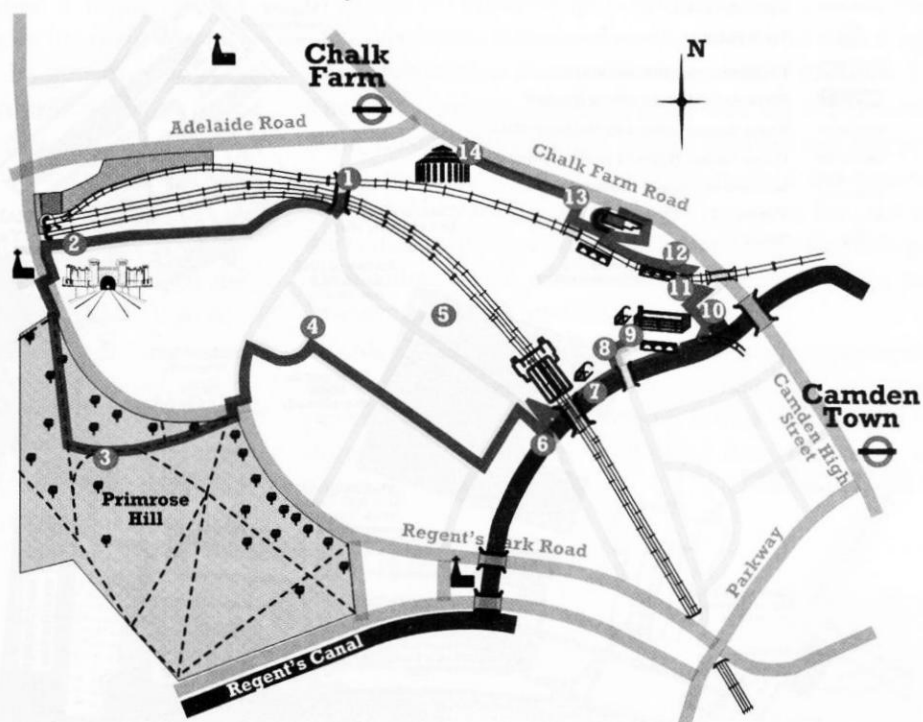


Figure 1 Area of Interest

Only passengers went as far as Euston. Camden handled all freight, which was transferred to road for distribution around London, or to the Regent's Canal for transport to and from the London docks.

Just over four years after the L&BR received Royal Assent, the Euston to Boxmoor section opened on 20 July 1837. The through line from London to Birmingham opened for public service on 17 September 1838. Maudslay, Sons & Field of Lambeth supplied 12 Bury-type 0-4-0 locomotives for the L&BR as well as the winding engines, delivery of which was delayed by repairs to the Regent's Canal. Various Stephenson and other locomotives worked trains up the Incline until the winding engines were commissioned.

2. Camden Goods Depot

Plans for the London terminus near King's Cross had been rejected by Parliament, and Stephenson, ordered to make economy cuts, initially proposed a terminus in Camden Town at a depot by the side of the Regent's Canal, adjacent to Hampstead Road (now Chalk Farm Road). From what became Camden Goods Depot, some rail freight could be transferred to the Canal and other freight discharged onto the road system.

In 1839 the Goods Depot of some 30 acres included a locomotive shed, a goods shed, coke ovens, cattle pens, stabling for 50 horses, wagon building/repair facilities and offices. The stationary winding engine vaults were located on the mainline to the west of the Depot. Pickfords had a large warehouse on the south side of the Canal with stabling in the basement. Train access was via two rail bridges.

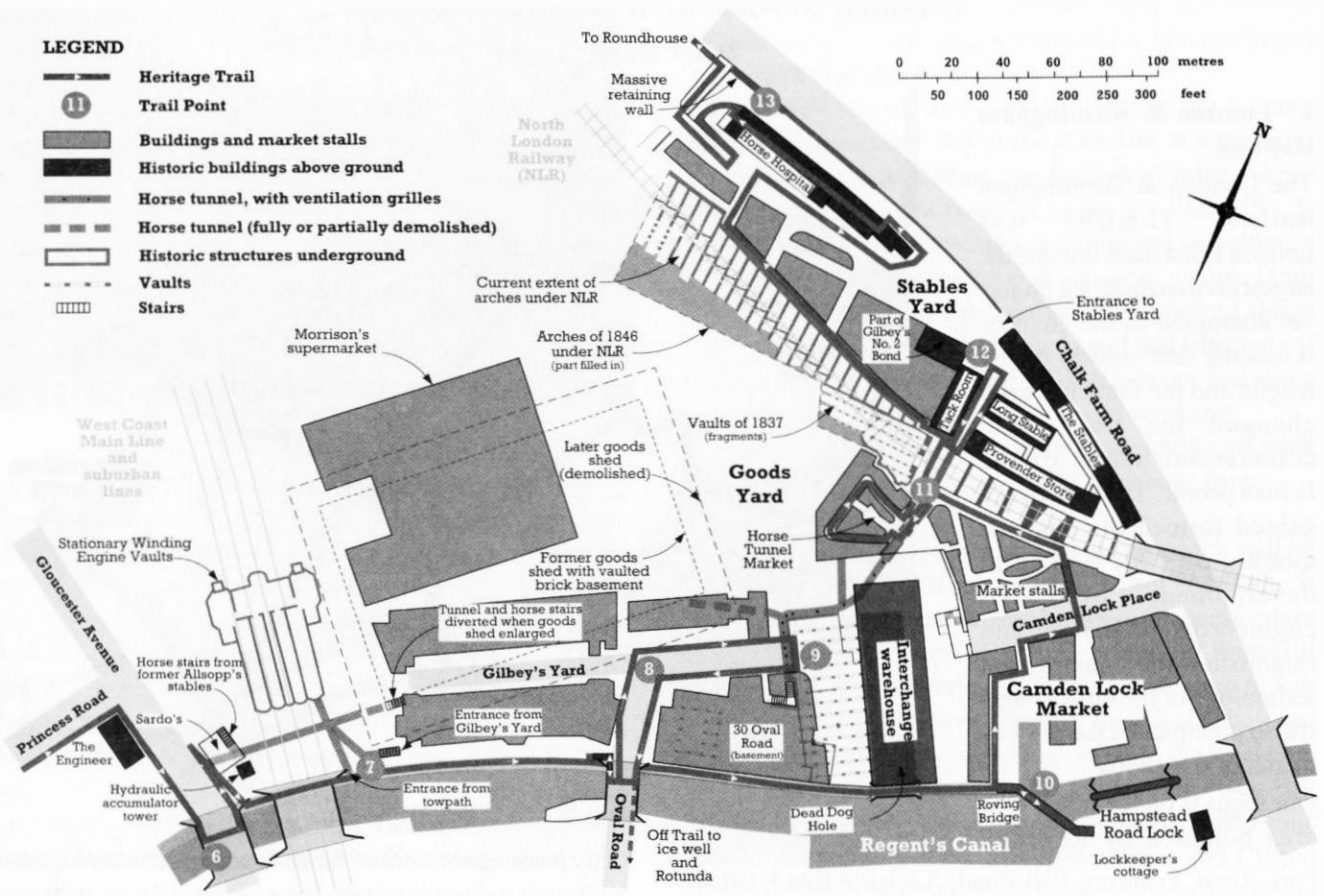


Figure 2 Camden Goods Depot

Land was raised about 13 feet to railway level as far as Oval Road in the east using fill from Primrose Hill Tunnel and cutting. In 1854-6 this level was extended to its present boundaries. Early railway buildings were raised on foundation vaults, creating an extensive underground network that linked with the viaduct of the North London Railway (NLR). Figure 2 shows the key historic features of the Goods Depot in the context of the present development of the area.

The goods shed and stabling were soon much expanded. The goods shed of 1864 had a plan area of 100,000 sq ft and was the largest in the country. It was further enlarged in the 1930s. The main goods shed and other sheds, warehouses, stables and features are shown in the aerial photo in Figure 3.

As the economy grew, goods brought by the London and North Western Railway (LNWR), which was formed from the L&BR and other rail companies in 1846, were dispersed from Camden Town to every part of London. By the 1870s Camden was a major transport hub in a network of railway lines handling up to 30 goods trains to and from "the country" each night.

3. Rope Haulage on Camden Incline

The stationary winding engine house was built by Robert Stephenson to pull trains up the incline from Euston to Camden Town, known as Camden Bank or Camden Incline. Both the winding engines and the 19 ft deep cutting to Euston responded primarily to the objections

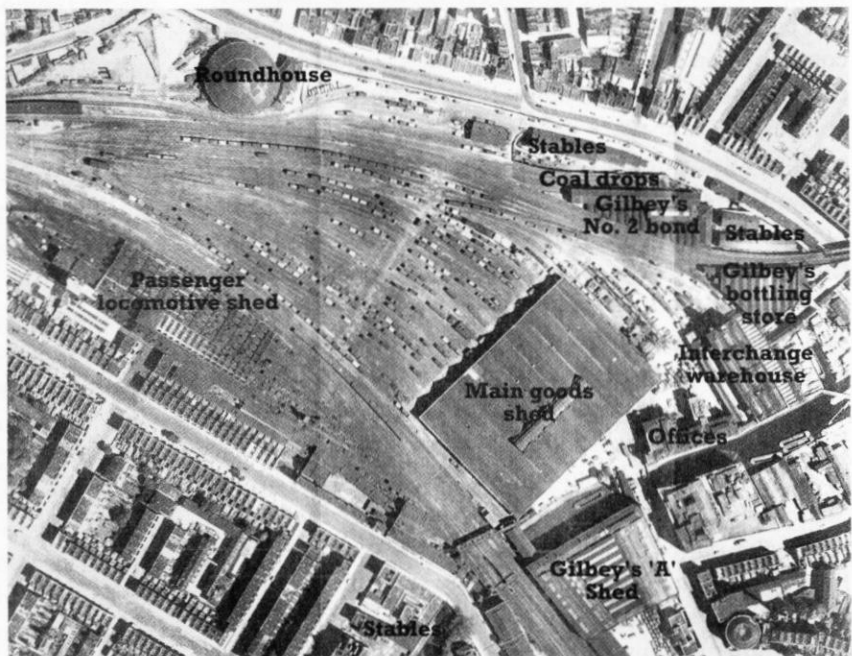


Figure 3 Aerial view of Goods Depot, 1948

of influential local residents concerned about the noise and smoke from locomotives toiling up the Incline.

The winding engine house formed a large vaulted underground structure, located under the main line just north of Regent's Canal Bridge. Its construction was drawn by John Bourne in 1837 (Figure 4). Although there is artistic licence in the relative size of workers and works, the scale of the works and the method of construction are dramatically captured.

The transverse engine vault is clearly visible (the farther of the two). It is 15ft 6in high and 30ft wide. Despite the impression given by the workers' size, the soffit lies only 4ft 6in below the level of the rails. The nearer transverse vault is that of the sheave rooms and workshops, and is 25ft across. The chimneys are being built in the two far corners. On the right the centring for the eastern coal store vault is being erected. On the near side the counterforts for the wall of the western coal store vault (still to be built) are evident.

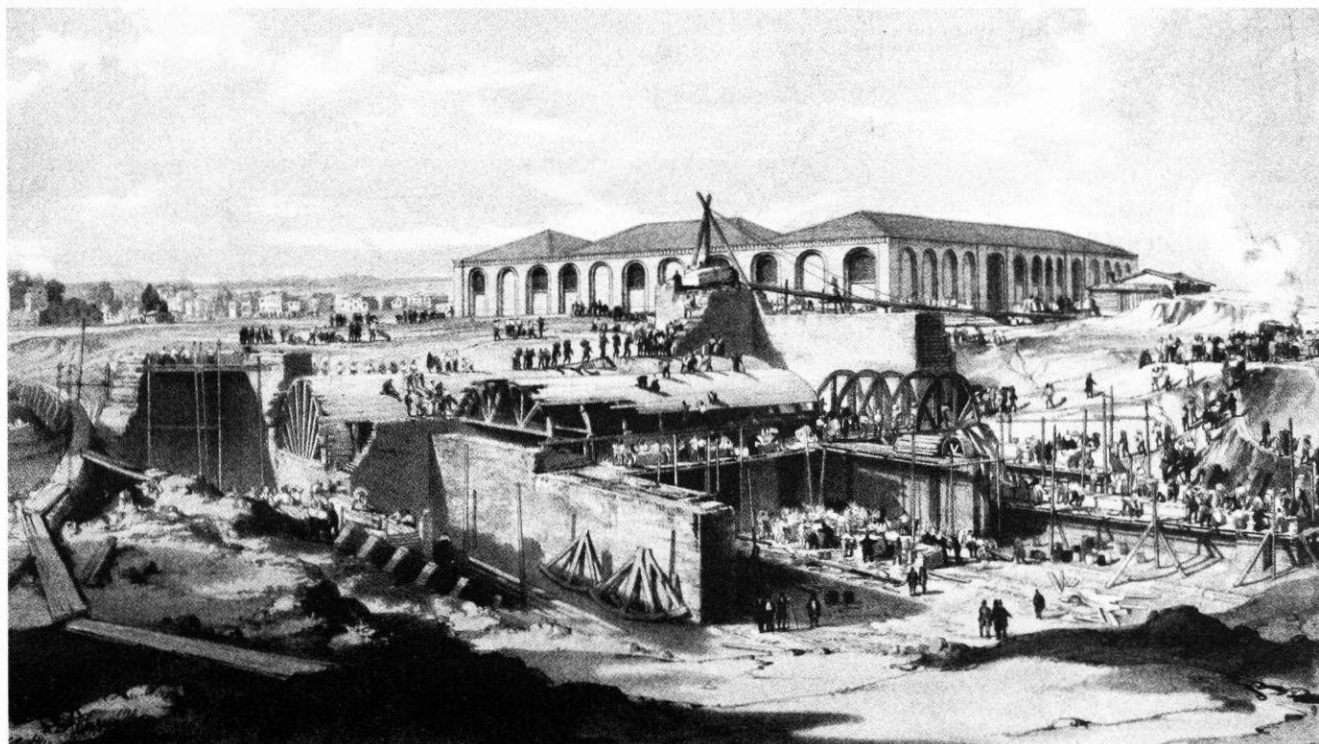


Figure 4 Winding Engine Vaults under Construction, 1837 (JC Bourne)

The original plan was for Euston to serve both the L&BR and the Great Western Railway (GWR). However, as a result of Isambard Brunel's insistence on a 7ft gauge for the GWR, and other disagreements between the rail companies, the western pair of lines was not used by the GWR.

The stationary winding engines started service on 14 October 1837. From then until 1844, trains of up to 12 coaches – weighing about 60 tons – were worked up the Camden Incline by an endless rope that ran around a 20ft driving wheel and other large sheaves and pulleys. At a maximum speed of 20 mph the driving wheel rotated at 30 rpm.

The tarred hemp rope 4080 yards long was claimed to be the longest unspliced rope on record. It was kept taut by means of counterweights sunk into a well at one end of the vaults and occasional resplicing to limit stretching. The mechanism is illustrated schematically in Figure 5.

The pulley system could not cope with the sharp curve at the Euston platform end. On the outward run, porters (soon replaced by a locomotive) pushed the loaded coaches 250 yards down the slight incline to the start of the endless rope located at a pulley under the first bridge. The leading coach was attached by a device called the 'messenger' to the endless rope.

Guards at Euston were able to signal to the winding engine controllers by means of a pneumatic telegraph, an organ pipe operated by compressed air. It took 3-4 minutes to draw the train over the mile or so from Euston up to Camden.

At Camden the train from Euston arrived at the Iron Bridge that carried the railway over the Regent's Canal and the 'messenger' was cast off before the train reached the winding engines below. Carriages were then allowed to run along the line until they met and were harnessed to the locomotive engine by which they were pulled to Birmingham. From the stationary engine house to Regent's Park Road Bridge the gradient reverses from the climb up the Incline to a slight fall. This was engineered deliberately to check the speed of a train coming into London, and to give an impetus to one leaving London.

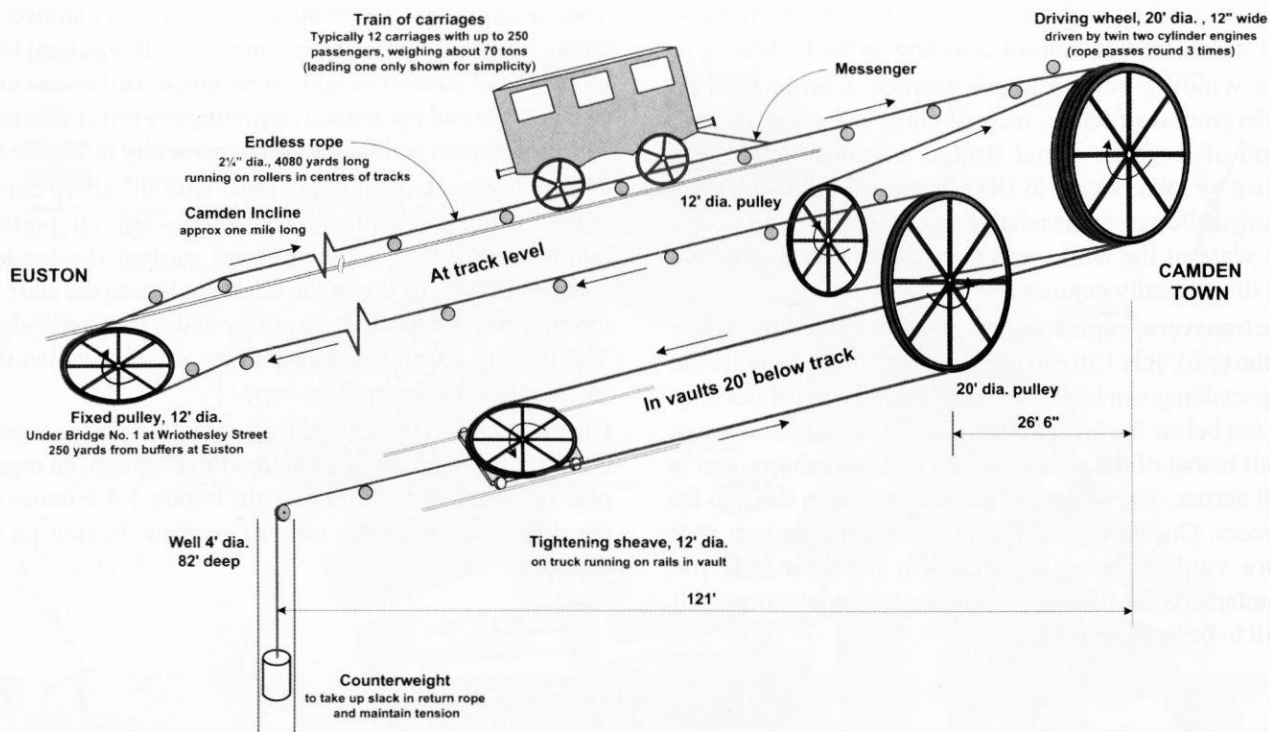


Figure 5 Stationary Winding Engine Mechanism

Trains from Birmingham would stop at Camden for tickets to be collected and for the locomotives to be disengaged. A locomotive can just be seen on the upside line (leading into London) between the two chimneys in Figure 6. It has been detached from the front of the train into sidings, moved to the rear and given the train an impetus towards Camden Incline. The train, now controlled by a guard known as a 'bankrider', is shown travelling under gravity down the slope to Euston Station at a maximum speed of 10 mph. The endless rope can be seen between the rails of the right-hand pair of rail tracks.

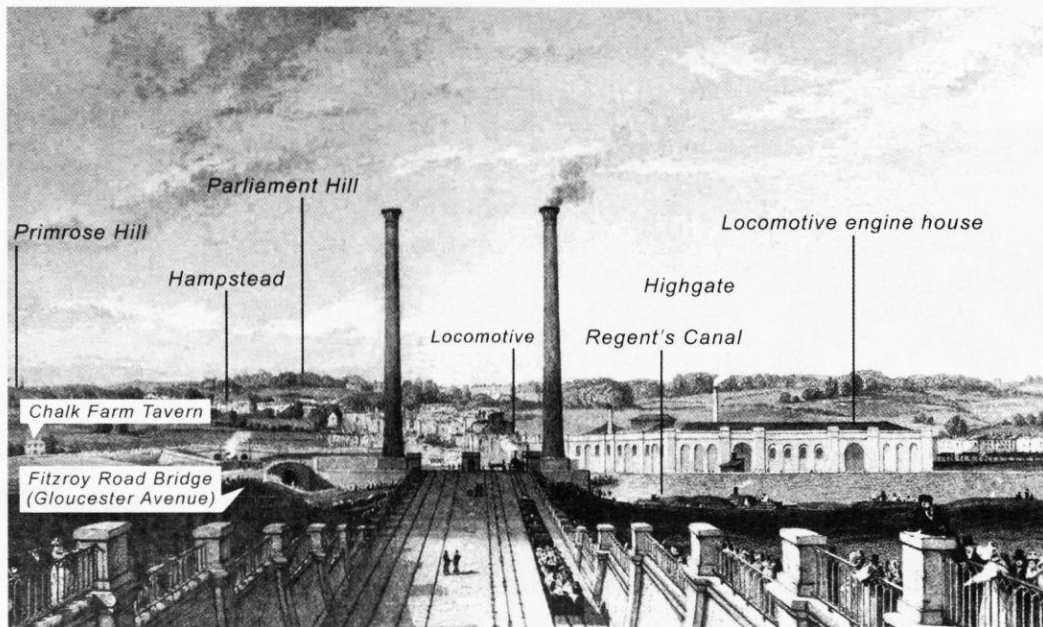


Figure 6 Camden Incline, Stationary Engine Chimneys and Locomotive Engine House c.1838

The train, now controlled by a guard known as a 'bankrider', is shown travelling under gravity down the slope to Euston Station at a maximum speed of 10 mph. The endless rope can be seen between the rails of the right-hand pair of rail tracks. The two prominent chimneys of the engine house became a tourist attraction. They were 133ft high and tapered from 12ft diameter at the base to 6ft at the top. Only the eastern half of the engine house was equipped with machinery, the western half, intended for the GWR, being now redundant. Entering by the spiral staircase on the east side of the tracks, the first point reached is the boiler house. The boilers were supplied from coal stored

in vaults 116ft long, 15ft wide and 20ft high running southeast towards the Regent's Canal. The boiler rooms are 44ft long by 24ft wide, with workshops of 20ft by 15ft on their south sides. Two marine boilers 18ft long, 7ft 6in wide and 8ft 9in high were installed in the eastern boiler room. Two twin-flue circular boilers 20ft 6in long and 7ft 8in diameter were installed in 1838 in the western boiler room, with 100ft of 9.5in connecting steam pipe. Beyond the boiler house is the transverse vault, 72ft long by 30ft wide by 15ft 6in high, which housed two Maudslay, Sons and Field condensing beam steam engines

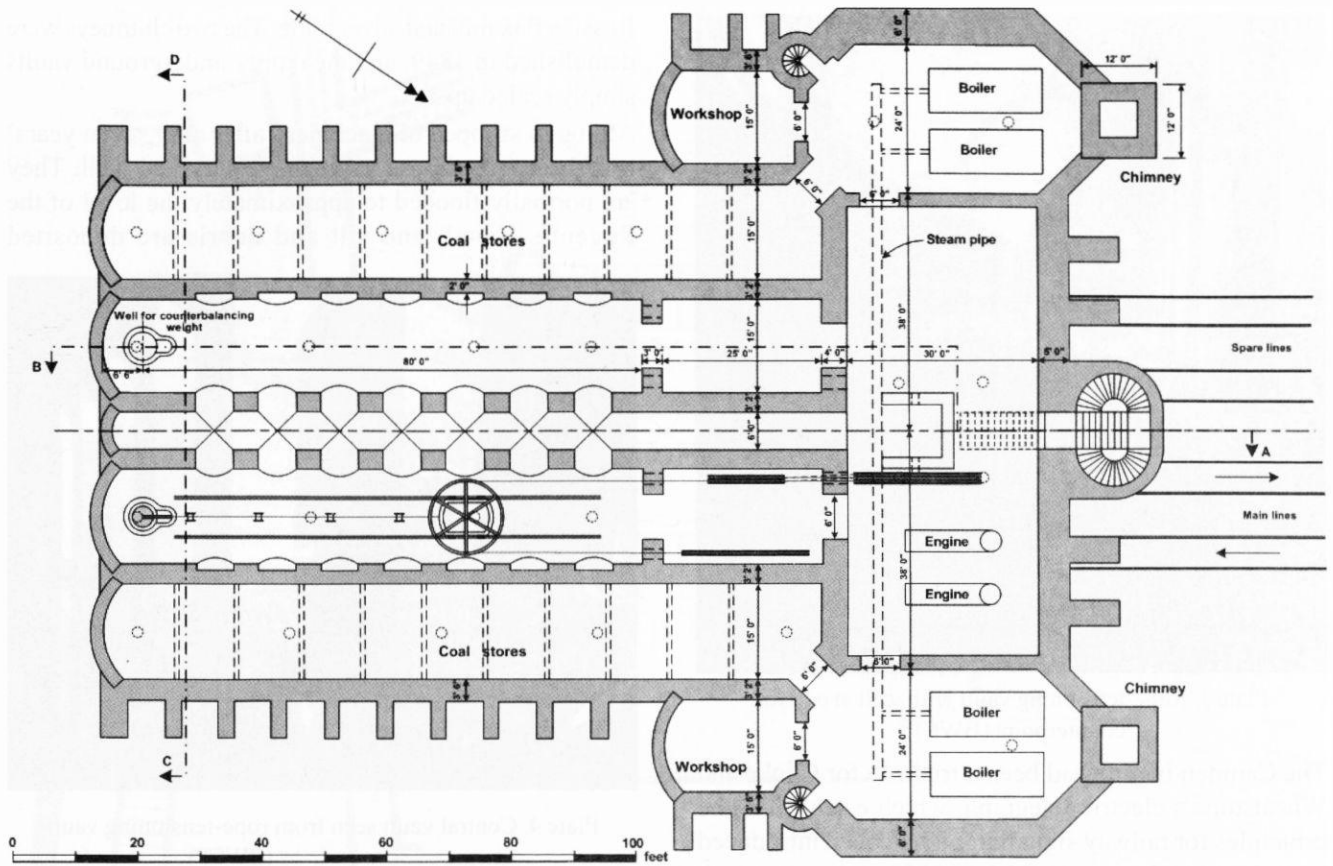


Figure 7 Plan of underground Stationary Engine House

of 60 hp working side by side on a common shaft driving a flywheel. The cylinders were 43 inches in diameter, with a stroke of 48 inches. The driving sheave would have pierced the roof and been mounted on the structure whose remains are seen in the centre of the engine room vault.

Directly opposite are three openings, the two wider openings leading to long vaults, parallel and similar in size to the coal stores, in which the rope-tightening mechanisms were housed. At the far end of each vault are the wells into which the counterweights were sunk. The central vault is 6ft wide with seven arched openings to the rope-tightening vaults on either side. The floors are invert vaults.



Plate 1 Coal vault (BWCP)



Plate 2 Engine room vault (BWCP)

The arrangement of the pulleys and tightening mechanism is shown in Figure 5 and in the longitudinal section in Figure 8.

The chimneys, rope openings, vent holes and staircases, encircled with palisades, down to the boiler and engine rooms were the only surface evidence of the work going on below ground.

On the north side of the transverse engine vault (Plate 2) is a staircase for communicating with the signalman who supervised the movement of trains up the Incline.



Plate 3 Rope-tensioning vault with well at end for counterpoint (BWCP)

The Camden Incline had been a trial site for Cooke and Wheatstone's electric telegraph, which established the principles for railway signalling; it had been introduced by Robert Stephenson on 25 July 1837, only one month after it had been patented. However, it was decided to retain the pneumatic telegraph.

Coal (anthracite) was transported by canal, offloaded at the rail bridge over the canal, and taken by trucks running on light rails through a tunnel connecting the towpath to the coal stores (Figure 9). Operations staff consisted of an engine man, three stokers and cleaners. How the vaults were kept dry is not clear, but the effectiveness of the puddled clay canal lining and a large borehole for water supply will have contributed.

Russian flax mill and silver mine. The two chimneys were demolished in 1849, and the empty underground vaults simply sealed up.

Although stripped of machinery after only seven years' use, the engine house vaults have survived well. They are normally flooded to approximately the level of the Regent's Canal, and silt and debris are deposited

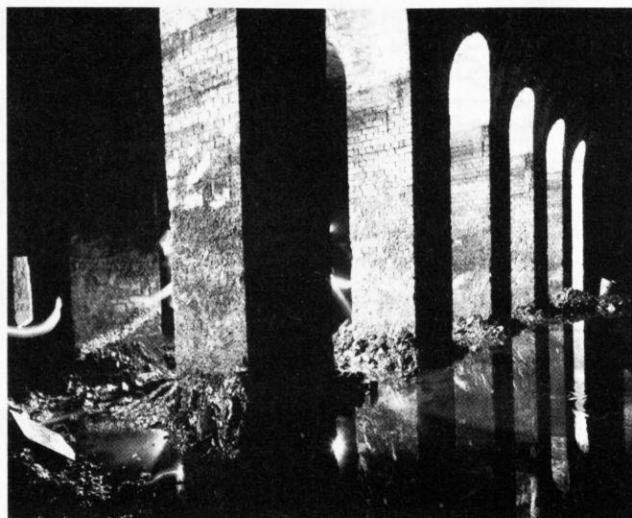


Plate 4 Central vault seen from rope-tensioning vault (BWCP)

throughout to about a foot in depth. The vault in the northeast boiler room has partially collapsed, but otherwise the vaults have suffered little damage.

The vaults are Grade II listed (an application to upgrade to II* has been submitted) and according to English Heritage "Their majestic scale puts them in a class with other celebrated engineering monuments of the railway age." The grandeur and mystery of their cathedral-like interior leave a strong impression.

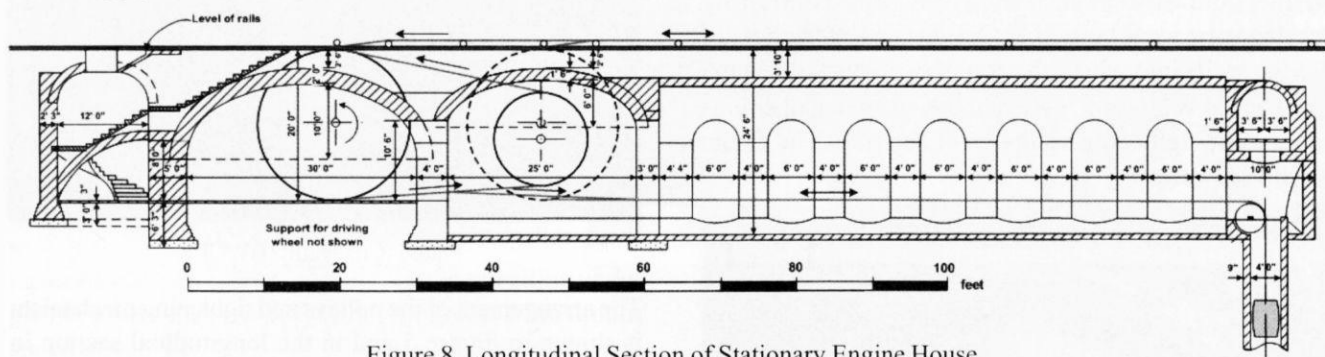


Figure 8 Longitudinal Section of Stationary Engine House

By 1843 mail trains had started to be worked by locomotive on the spare lines, and after 1844 larger locomotives were again used to manage the gradient, usually with a second locomotive either in the front or 'banking' by pushing in the rear. The gradient always gave them difficulty, and not until the days of diesel and, later, electricity did the gradient become insignificant. The stationary engines and associated equipment were auctioned in 1847 and found useful employment at a

4. Vaults under North London Railway

The L&BR and its sidings were partly carried on an embankment formed by fill from Primrose Hill cutting and tunnel and partly on foundation vaults. George Scharf, a keen observer of the changing face of London in the first half of the 19th century, made what appears to be the only sketch of the construction of the first foundation vaults of the Goods Depot. His sketch (Figure 10) shows

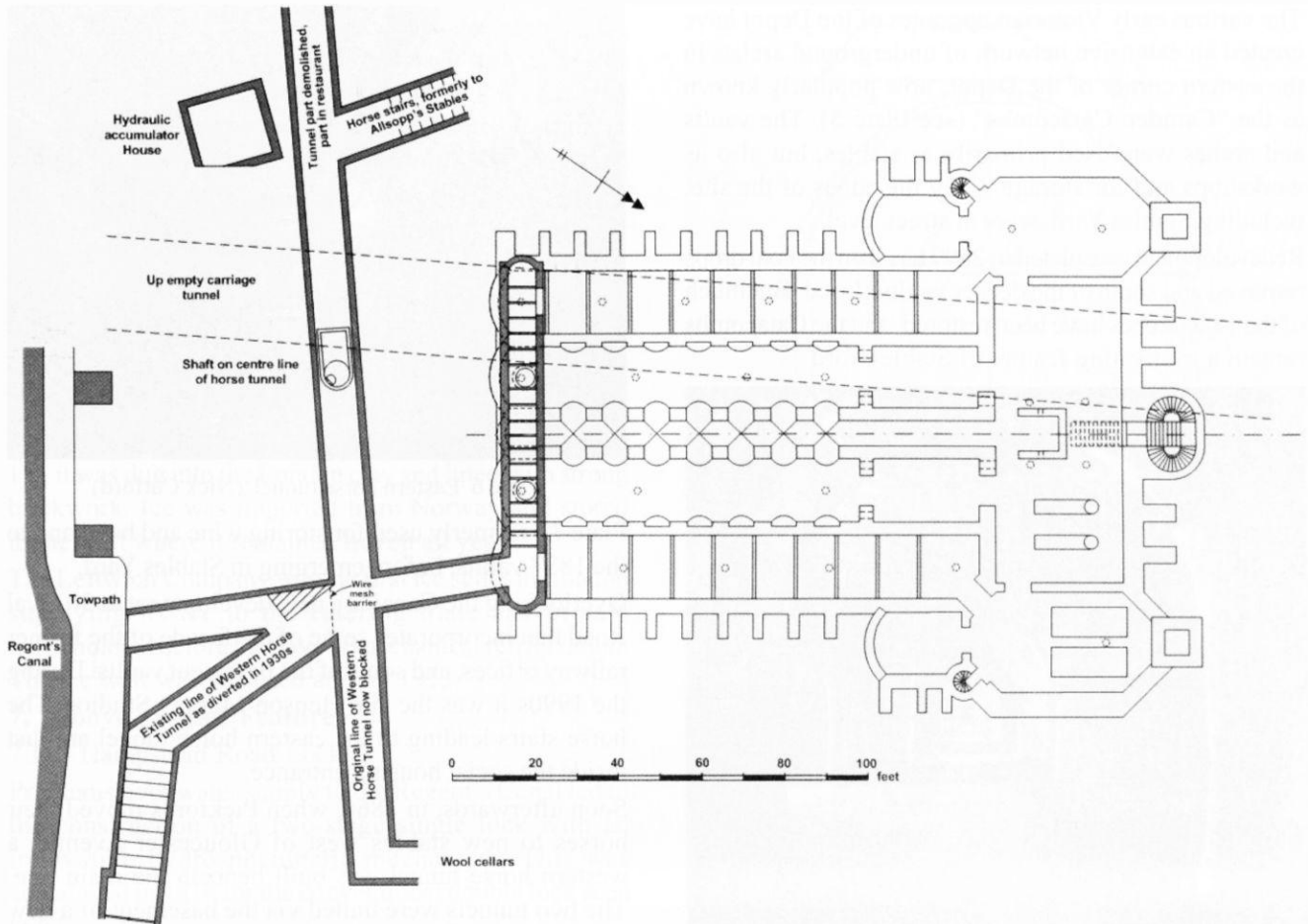


Figure 9 Access to Stationary Engine House

the foundation vaults for the goods sidings alongside Hampstead Road (now Chalk Farm Road) looking northwest.

The rail approach to the Goods Depot was directly in line with the artist's view and wagons would be turned into the sidings along the 'fingers' created by the foundation vaults. The sketch clearly shows the elevation of the railway level above street level in the right foreground.

The main line runs from the far side of the Locomotive Engine House up to the bridge on Chalk Farm Lane (now Regent's Park Road). Chalk Farm Tavern, noted at the time for a diverse range of entertainments for Londoners, is located where the artist has written "Chalk Farm".

As the Goods Depot expanded rapidly, particularly over the next 20 years, the original foundation vaults were progressively obliterated or reconfigured to support a different set of structures. The reconfiguration of 1846, which replaced the Locomotive Engine House with the Roundhouse and a Passenger Locomotive Shed, included a wagon construction shop over the eastern fingers shown above, creating a new set of vaults.

In 1850 the viaduct of the North London Railway (NLR) was constructed on the line of the approach to the 1837 Goods Depot and over the wagon construction vaults. It

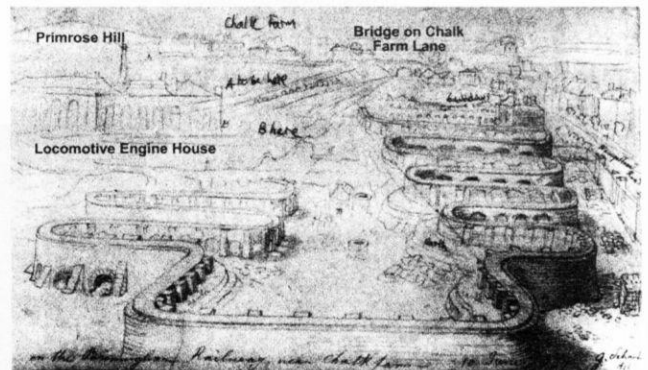


Figure 10 "On the Birmingham Railway, near Chalk Farm 10 June 1837", George Scharf

was moved northwards in 1855 as part of a major remodelling of the Goods Depot, requiring the vaults to be extended as arches, which were further extended by the construction of coal drop sidings.

As part of the 1855 expansion, the remains of the 1837 vaults were connected with the eastern horse tunnel at the south end and were used by Gilbeys as bonded storage. In the 1980s, with the sale of the Goods Depot land, parts were filled in for Safeways car park above and other parts demolished. What remains of the 1837 vaults has now been incorporated into Stables Market, under the NLR.

The various early Victorian upgrades of the Depot have created an extensive network of underground arches in the eastern corner of the Depot, now popularly known as the “Camden Catacombs” (see Plate 5). The vaults and arches were used primarily as stables, but also as workshops and for storage. Only the edges of the site, including Stables Yard, were at street level.

Redevelopment completed in 2009 has seen the coal drops removed and some of the deeper vaults closed. But much of the 1846 arches have been restored, and the Catacombs remain a captivating feature of Stables Yard.



Plate 5 Camden Catacombs (vaults of 1846)
(Nick Catford)

5. Vaults and Horse Tunnels of 1855

In the second half of the 19th century the area now bounded by Gloucester Avenue, Regent’s Canal, Chalk Farm Road and Regent’s Park Road was a maze of stables, vaults and tunnels. It was also home to over 400 shire horses that hauled delivery carts to and from the railway and canal, shunted railway wagons around the 33-acre Goods Depot – a complex web of rail sidings and turntables – as well as supplying the warehouses and bottling plants that occupied much of the site.

In 1854-56 the remodelled Goods Depot extended the land at railway level to its present boundaries. A horse tunnel was provided under the new embankment so that horses could move to and from their stables more safely beneath the tracks.

It is of round-arched construction with cast-iron ventilation grilles placed regularly in the roof, originally the only source of light (Plate 6). It connected to the extensive system of vaults west of the Interchange Warehouse (see Figure 2 and

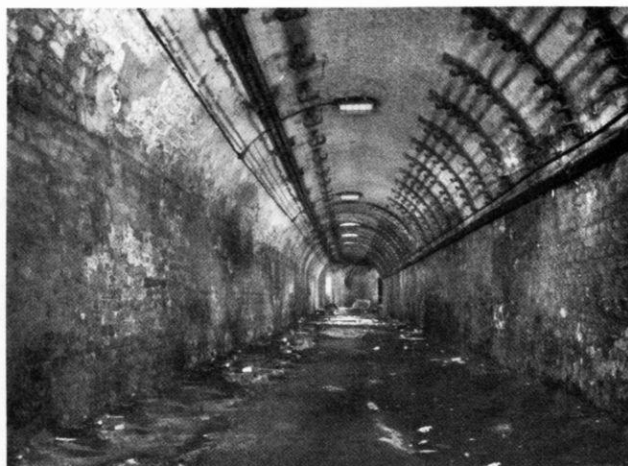


Plate 6 Eastern horse tunnel (Nick Catford)

Plate 7), formerly used for storing wine and beer, and to the 1837 vaults, before emerging in Stables Yard.

Overlooking the Canal is a new development at 30 Oval Road that incorporates some of the façade of the former railway offices, and some of the basement vaults. During the 1990s it was the Jim Henson Muppet Studios. The horse stairs leading to the eastern horse tunnel are just inside the social housing entrance.

Soon afterwards, in 1860, when Pickfords moved their horses to new stables west of Gloucester Avenue, a western horse tunnel was built beneath the main line. The two tunnels were united via the basement of a new large goods shed that replaced previously scattered facilities in 1864, providing a safe passage for horses across the whole site.

Samuel Allsopp & Sons, brewers, had stables on the east side of Gloucester Avenue that gave access to the horse

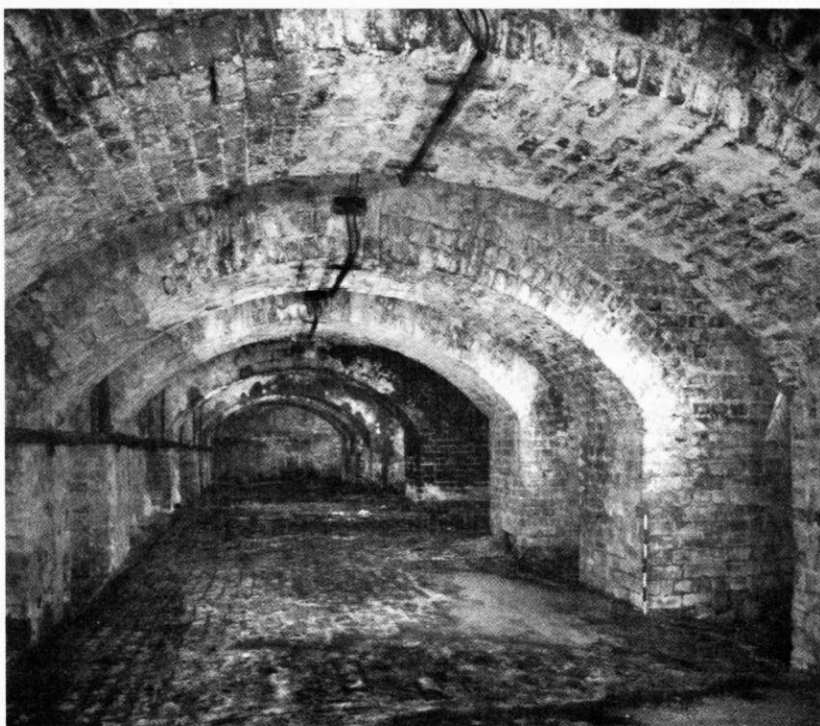


Plate 7 Vaults below Interchange forecourt (Nick Catford)

tunnel. The Regent's Canal towpath also connected with the western horse tunnel via the passage formerly used to supply the winding engine vaults (Figure 9). Sardo Canale restaurant at 42 Gloucester Avenue has made a feature of a short length of the western horse tunnel in their dining area.

6. Ice Well

The ice well below 34-36 Jamestown Road was built in 1839 by William Leftwich and deepened in c.1846. It is the largest ice well in London, measuring about 30m (100ft) deep and 12m (40ft) wide, and held about 2,400 tons of ice.

Shaped as a tapered cylinder with a domed top (Figure 11), it was dug into the London clay and lined with strong brickwork. Ice was imported from Norway and stored in the well where it remained frozen all year.

The Leftwich Company was the first ice seller in London supplying its ice to the catering trade and private householders before the days of mechanical refrigeration. The ice well was last used around 1913.

7. Above-ground Features

7.1 Hampstead Road Lock

Problems over water supply to the Regent's Canal led to the construction of a two-stage single lock with an innovative hydro-pneumatic mechanism. This was abandoned in 1818 for the conventional double lock seen today.

The Roving Bridge of cast iron (Grade II) dates from 1845. There is a fine panorama from the bridge of the Lock Keeper's Cottage, Hampstead Road Lock, Camden Lock Market, the Interchange Warehouse and the Regent's Canal. The stone and metal parapets and handrails are scarred by the tow ropes of barges drawn by powerful, specially trained horses out of the lock and under the bridge which takes the towpath back onto the northern side of the canal.

The Lock Keeper's cottage (Grade II) on the south bank is now the Regent's Canal Information Centre and dates from c.1816. It was extended and altered c.1975.



Plate 8 Hampstead Road Lock and Regent's Canal

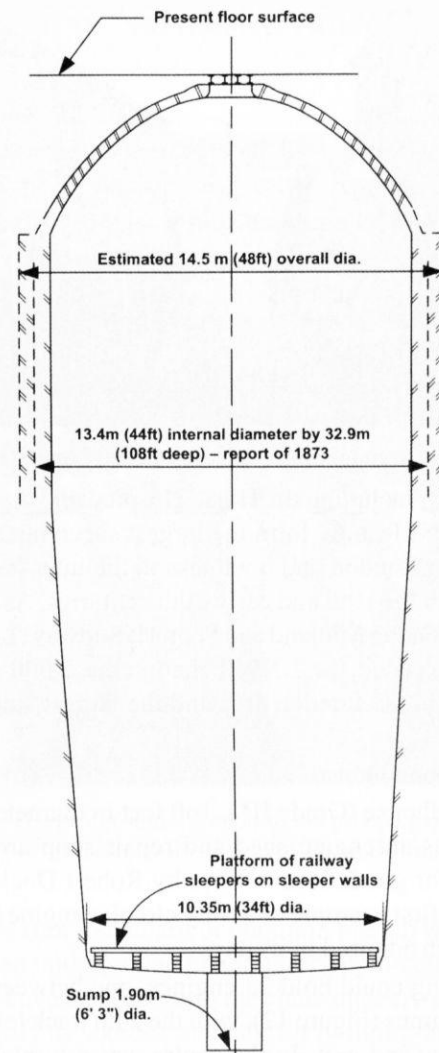


Figure 11 Ice well

7.2 Stables Yard

As part of remodelling the goods yard in 1854-56, four new stable blocks (Grade II) were built in the wedge of land formed by Chalk Farm Road and the NLR, replacing four earlier stable blocks. Identified as The Stables, Long Stable, Provender Store and Tack Room on the map in Figure 2, some retain their haylofts with pitching doors at the upper level, but others have upper floors, reached by ramps, that were added later.

Some stable blocks were later extended or raised by additional storeys. Horses were also stabled in the vaults under the railway arches. Stables Yard, as it became known, had a single entrance from Chalk Farm Road.

A fifth stable block was added a little further north in 1882-83, and became known as the 'Horse Hospital'. The Horse Hospital (Grade II), now partly refurbished as the Proud Gallery, retains the original layout and furniture of 12 loose boxes in one room and stables at railway level, with the cart sheds below adapted for stables.

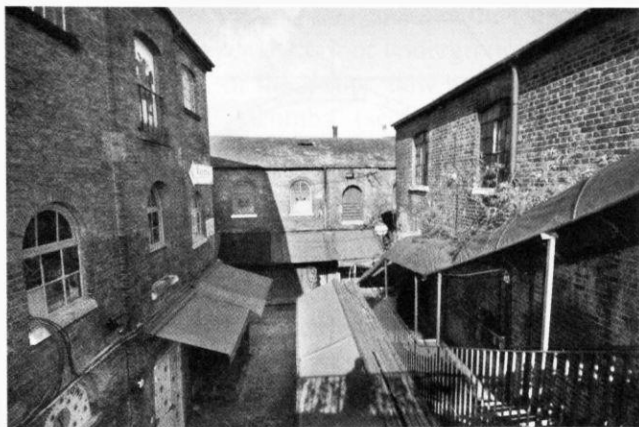


Plate 9 Provender Store, Tack Room and Long Stable

The stables, including the Horse Hospital and the vaults under the NLR, now form the largest surviving stables complex in London and a witness to the importance of the horse in the 19th and early 20th centuries. As late as 1938 the London Midland and Scottish Railway (LMSR), which succeeded the LNWR, had some 2,000 horses employed in the London area and the largest stud farm in the UK.

7.3 The Roundhouse

The Roundhouse (Grade II*), 160 feet in diameter, was designed as an engine shed and repair shop around a turntable for goods locomotives by Robert Dockray in 1846. The first example of a truly circular engine house, it was much admired in its day.

The building could hold 23 engines, one between each pair of columns (Figure 12), with the 24th track left clear for entrance and exit. In the centre was a turntable 36 feet in diameter onto which engines ran to be turned into their berths. Below were brick vaults, founded at natural ground level, which raised the turntable and engine storage bays to the railway level.

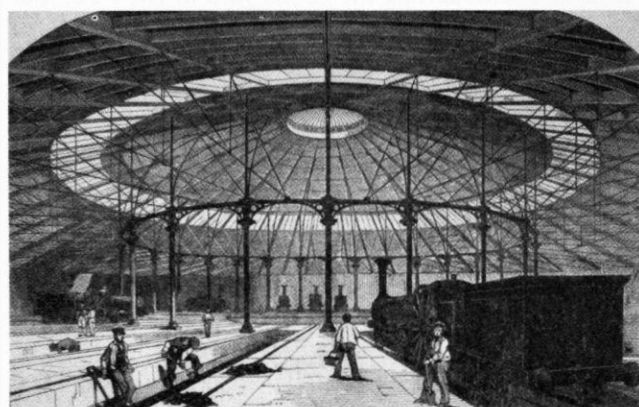


Figure 12 "The New Great Circular Engine House", 1847

The Roundhouse was taken out of service on strategic grounds in 1855 to permit replanning and enlargement of the Goods Yard. In 1869 it was leased to Gilbeys as a bonded warehouse for spirits. Gilbeys, which became the world's largest drinks firm and was the major employer

in the area, used the warehouse for almost 100 years, until 1964.

The Roundhouse has recently undergone a comprehensive £30million restoration and development to create a major performance space at railway level and creative centre for young people at street level. It reopened in June 2006.

7.4 The Interchange Warehouse

The Interchange building (Grade II), completed in 1905, was designed to facilitate transshipment between canal, rail and road and to provide storage in the magnificent warehouse on three floors above (see Plate 8).

Massive octagonal pillars support brick fire-resisting floors with solid timber floors above. Rail access was on the east side, and road access on the west, with a canal basin 210 feet long and 44 feet wide – known as 'Dead Dog Hole' – providing room for six 14-foot-wide barges. The towpath crosses Dead Dog Hole by a bridge dating from 1845. A water tower at the north end serves for firefighting.

7.5 Primrose Hill Tunnel East Portals

The L&BR agreed with Eton College, owners of the land, to construct a tunnel through the Chalcot Estate. Eton insisted that "...the mouth of the Tunnel at the eastern end shall be made good and finished with a substantial and ornamental facing of brickwork or masonry to the satisfaction of the Provost and College."

Considered a great feat of engineering in its time, the 1837 tunnel, the further north of the two, was London's first railway tunnel and the first to treat one of its portals architecturally. Visitors were attracted by the classical features and the open carriages emerging from darkness. The original portal has been faithfully replicated in the later 1879 portal on the south side.

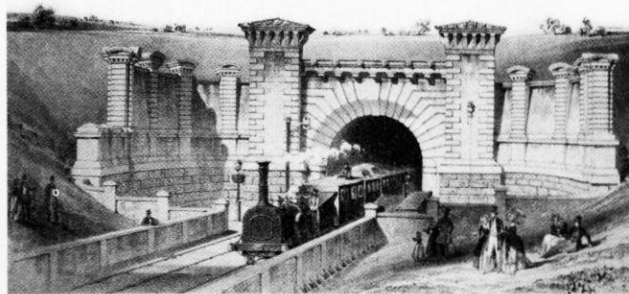


Figure 13 Primrose Hill Tunnel East Portal, c.1840

Camden Railway Heritage Trust, formed in 2006, is active in conservation, restoration and raising public awareness of the area's rich railway history. Its founder and secretary Peter Darley gave an illustrated talk on the subject at Sub Brit's Spring Conference in April 2009.

Peace After The Battles: Study Weekend in Northern France

2 – 4 May 2009

Paul W. Sowan

This year's mainland Europe Study Weekend, Saturday to Monday, 2 - 4 May 2009, was again to France (Belgium and the Netherlands have also featured in earlier years) and was again based in Arras, capital of the Pas-de-Calais département and of the former province of Artois (Latin *Artesium*). The English language owes to French the words 'arras' (a form of tapestry) and 'artesian' deriving from this locality. The first artesian, or overflowing, well is claimed to have been sunk hereabouts in 1126, doubtless to the great joy of whoever's job it had previously been to haul up bucketsful of water!

It was good, this year, to have along with the 'regulars' a healthy crop of first-timers who all, I hope, enjoyed as ever the meticulous planning of our indefatigable organising team – Linda Bartlett and Martin Dixon.

Arras, on the River Scarpe, is perhaps nowadays best-known as a focal point in the World War I Battle of Arras, the first of the big battles of the third year of hostilities. Arras, then, was almost destroyed but not taken by Germany, although the front line was a very short distance from the town centre, as can be seen from the maps of the Arras 'caves and subways'.

ARRAS

There are two very large squares, surrounded by shop and restaurant fronts behind colonnaded arcades. Throughout the day you have a choice of a place in the sun, or a place in the shade as the mood may take you, in which to enjoy refreshments at pavement tables. Various of our members took the opportunity to settle all the world's troubles over a glass or two in these congenial surroundings. Below one of the squares is a substantial

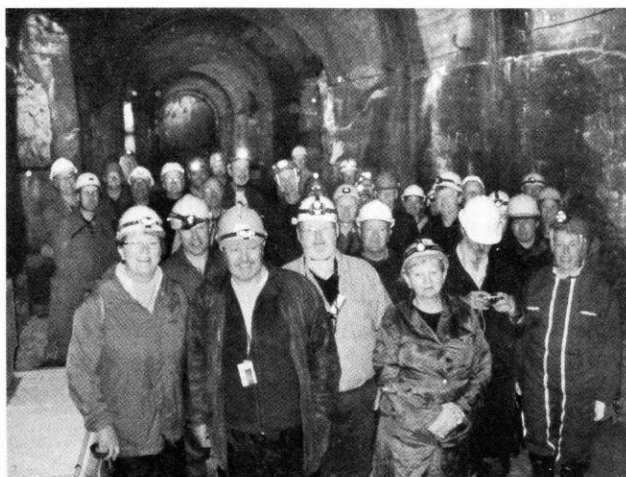


'The group' eating in a vaulted mediaeval underground restaurant in Arras - Photo by Clive Penfold

underground carpark. Below both are the 'boves' or excavations into the chalk bed-rock.

These central Arras *boves*, open to the public and entered via the Tourist Information Centre in the Town Hall, are well worth a visit. Sadly (at least from an archaeological

point of view), during our visit they were in use for some sort of modern art display, so this year we gave them a miss, in favour of the Wellington Quarry, out of the centre, described in detail below.



'The group' underground in the private galleries at La Coupole - Photo by Brian Hillman

A *bove* (not a standard or common French word) seems to be an underground chalk quarry-cum-cellar. A great many have been dug into the chalk under Arras, perhaps primarily as sources of chalk for building-blocks (used internally) or for lime for mortar. Subsequently the cavities have been used as cellars. At some point in the centre of Arras, and certainly during World War I in the southeastern outskirts, numbers of these initially isolated 'caves' have been linked together by secondary tunnelling. At the centre, the linked *boves* have long been a tourist attraction. That the component 'caves' here were mostly excavated individually is attested by constant changes of floor-level.

What is hard to imagine is that the two central squares, and indeed the striking Town Hall at the western end of one of them, were reduced to rubble during hostilities, and have been faithfully restored to their original appearance: we never did anything of the sort in our own World War II damaged parts of Canterbury or Coventry! Other than brick, the predominating building material in exterior fabric is a version of what the English call sarsen stone, a lithified fine-grained sandstone derived from beds of sand laid down in Lower Tertiary times, so above and younger than the Upper Cretaceous Chalk. This material is most prominent in the columns and arches around the two big squares. Chalk blocks (and a lot of bricks) are found interiorly, as in the vaulting of cellars: we were able to admire these features during subterranean evening meals in the town.

UNDER WAY and UNDERGROUND – Saturday 2 May 2009

Our weekend started with the usual morning rendezvous at Ashford Station. Members old and new arrived, mostly in time to grab a coffee. Crosskeys, our always reliable coach company, had again come up trumps with Angus as our driver. Angus had read ahead of the sites we were planning to visit and so was well briefed with detailed routes planned. His first test was to pick up our final attendee (who had had to return for his passport) from a motorway service station. We have it on good authority that the maximum speed of a London Cab is 78 miles per hour!

Our first underground feature was the Channel Tunnel, now celebrating fifteen years of 'Shuttle' operations. As ever, many of us secretly hoped for a stop mid-tunnel to allow for a closer inspection of the construction and fit-out. This was not to be, however, and after an uneventful transit we set off southwards on the A26 motorway.

VIMY RIDGE – Saturday 2 May 2009

The Vimy ridge (around 8 km northeast of Arras), although not in absolute terms a notable feature, was in World War I a very significant place, commanding views northeastwards over the lower land towards the northern French coalfields; and, likewise, westwards.

All who have travelled along the A26 will have caught a distant glimpse of the memorial monument, on the northeast side of the road. The site lies within the Forêt Domaniale de Vimy, about 2.5 kilometres west of the village of that name, and is approached via road D55 between Givenchy-en-Gohelle and Neuville-St-Vaast.

This ridge was captured by German forces early in the 'war to end all wars' (if only!) and held against French counter-attacks in 1915. Canadian forces stormed the ridge on 9–10 April 1917. The names of the 11,295 missing soldiers from that campaign are now commemorated and engraved on the stone sides of Canada's national Great War memorial. This was unveiled in 1936 and, mercifully, unmolested by Hitler's forces in World War II (on the grounds that the lettering and sculpture on the monument contained no aggressive elements).



Preserved trenches at Vimy Ridge - Photo by Clive Penfold

So much is bald history. The reality of life here, and of many deaths here, on and under the ground in 1917, was something else.

It is difficult to know what to think about this memorial. What you see, on entering the site (technically Canadian territory, but with no border formalities) is a capacious and neatly kept car park, with (for tourists, which we were in reality) a few benches and picnic tables.



Shell holes on Vimy Ridge - Photo by Martin Dixon

Up the slope to the right are 'preserved' front-line trenches of both armies, shockingly close together, with the intervening no-man's-land nothing but a mass of gigantic craters. The trenches on both sides are, now, sanitised. They have dry concrete 'duck' boards. The trench walls are stabilised, now, by concrete 'sand-bags'. The craters are attractive grassy dells. The barren landscape of the battle has been softened with the planting of a forest of Canadian trees and shrubs – one for every missing soldier of the campaign.

You have to have read first-hand accounts of this place and others on the front lines as they were, say, in January or February over ninety years ago to take in the sheer horror of things. Soldiers lived, moved painfully slowly, slept, and died in knee-deep ice-cold mud and freezing rain, sleet or snow. These trenches were dug through churned-up mud containing the rotting remains of their former men-at-arms, or of their enemies – the difference no longer mattering. Only the small display of contemporary film footage and photographs in a nearby exhibition building reveal such details – 'details' indeed! And did we learn? Did the 'Great War' end all wars? Sadly, Adolf Hitler's adventure capped the horror, as we know. And much nastiness continues to this day.

This entire memorial park is staffed by refreshingly young Canadian students, eager ambassadors and communicators, who are fortunate (as are we) in having escaped the events and their like here memorialised. These young people have no recollection, and perhaps even little understanding, of the 'Cold War', never mind World War II! Whereas your reporter, now in his seventieth year, cannot forget the World War II air-raid

sirens, and the constant watchfulness, in the Cold War years, for roadside places of safety into which (however pointlessly) to dive if the four-minute warning sounded. A young Canadian student conducted us, perhaps more rapidly than we might have wished, through the Grange Subway. This tunnel and its ramifications and rooms, dug through chalk which at the ridge underlies a thinner deposit of clay, preserved a relatively safe line of communication with the front line. It was lighted, equipped with telephone lines, and included officers' and men's dining (feeding would be a more apt word), meeting, and sleeping (or dossing?) and storage quarters. Leading down from the main tunnel were much smaller inclined tunnels or saps which were used to lay huge mines and to detect German tunnelling. The tour was, again, an effort to connect what we were shown with the realities of 1917.



Command Post in Grange Tunnel, Vimy
Photo by Martin Dixon

Grange Subway is the best preserved of what was once five kilometres of tunnels at Vimy. These were often dug at night and the spoil disposed of in old quarries away from the front line in order to deceive German aerial reconnaissance. The whole complex was used on Easter Monday (9 April) 1917 to launch the Canadian offensive that led to the recapture of Vimy Ridge.

Later, we walked up the slope of the ridge to the not-very-high, but nevertheless commanding, summit, where stands the marble-clad memorial. The roadway up runs through forested land, nothing but a sea of craters which, again, are now so many attractive dells. Evidently bomb-proof sheep grazed contentedly (we assumed) in the shell holes, beyond 'danger – unexploded ordnance' notices. These warning notices are heeded by visitors probably as much as a matter of respect for the dead than as a matter of self-preservation.

We were met at the built edifice again by the young lady who had conducted us through the Grange Subway. It is claimed that the Vimy Ridge campaign, and its aftermath, led to the emergence of Canada as an autonomous nation in 1931. Before World War I people scattered across

this enormous north American territory travelled little, and met infrequently if at all. At the front in France, Canadians from across the continent met, and died, in conflict with a common enemy.

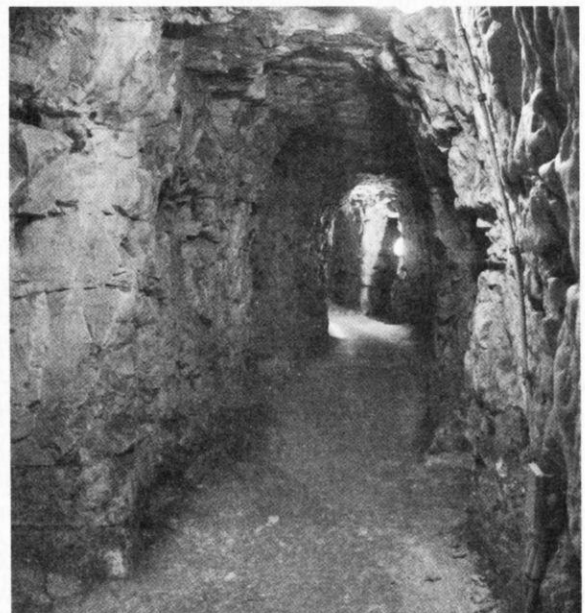
Because the architect took so long to choose the marble (sourced from Croatia) for the memorial monument, workmen at Vimy found themselves with time to spare: we are indebted to them for their initiative in securing the preservation of the largest recognisable sector of the front lines to survive as an accessible and respected place. The memorial itself has recently been restored. It has inscribed on its walls the names of those who died: most of us, I suspect, searched for family names (unsurprisingly, I found none). It has internal access shafts, and stands on a brick and concrete foundation incorporating (like the Albert Memorial in London's Hyde Park) an entirely functional 'crypt' which we did not visit. You cannot send thousands and thousands of men to fight in a foreign country without some notion of the terrain's water supply capabilities, and the suitability of the soil and subsoil for trench-digging, dugouts, and offensive and defensive tunnelling. The British Institution of Royal Engineers published, in 1922, a volume incorporating some account of World War I 'military geology'. Although this contains only 71 pages of text, it is a bulky volume containing 19 plates, many of which are linen-mounted and folded coloured geological maps and sections of parts of the Belgian and French war zone. Some extracts from this source have been used to illustrate this report.

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DOMQUEUR AND MESNIL-DOMQUEUR –
Sunday 3 May 2009

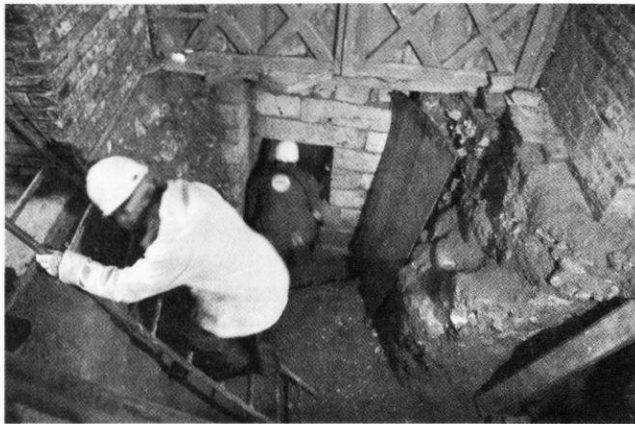
Both of these neighbouring villages, about 16 kilometres east of Abbeville, lie on minor roads to the south of road D 925 (about halfway between St. Riquier and



Gallery in muche at Domqueur - Photo by Martin Dixon

Bernaville). Both possess ‘muches’ excavated into the chalk. *Muches* are underground places of refuge, built in the 16th and 17th centuries to protect the local population from the ravages of the opposing armies.

Most frequently the entrance to *muches* was from a descending, twisting passageway, often descending at the west tower of a church. Sometimes it was from the cellar of a château or other large building. In most cases *muches* have a number of underground corridors or ‘streets’, off which emanate one-two-and exceptionally three-roomed chambers. It is postulated that each of these chambers was used by a single surface property or family as a place of storage and safety. There is much debate within French societies as to how often the *muches* were used to hide the local population and livestock, as opposed to preserve their grain and other foodstuffs.



The *muche* entrance at the west end of Mesnil-Domqueur church - Photo by Clive Penfold

In World War I, many of the *muches* were used as shelters for troops and dressing stations. Because of the position of the front line, more of the *muches* were used by Allied forces and in many there are extensive and evocative graffiti. In World War II a number of *muches* were used as civilian shelters – particularly during the bombing attacks on V-weapons sites, whose geographical spread is eerily similar to that of these ancient shelters. Domqueur is a small village, with a neat little green beside the church. It is a quiet spot. Mesnil-Domqueur is an even smaller and quieter place on a bend in the road, with a rather sadly neglected church, a modern community centre nearby and no green. *Mesnil* is a word ignored by the compilers of my own quite chunky French dictionary, so we were left to speculate that it might signify ‘lesser’, but the question remains unanswered. [Editor’s note: the word derives from Latin *mansionile*, meaning a small *mansio* or dwelling; it appears fairly frequently in place names in northwestern France.] The word *muche*, we were told, derives from an old French word meaning ‘to hide’; see *Subterranea* Issue 18, January 2009, page 44.

The Domqueur *muche* has been operated as a low-key visitor attraction for some years. The entrance is down some steps from the exterior of a cottage-cum-local

history museum, opposite the church. The guide’s commentary is in parts arguably a little embroidered, for example in describing a subterranean chapel (but, thankfully, no mention of human sacrifices as experienced at the nearby tourist site at Naours!).

This *muche* shows much wear on corners, perhaps on account of tourist traffic as well as original use. Small ledges 10 or 15 centimetres wide halfway up the walls of some of the rooms, claimed to be fireplaces, seem unlikely to have served that purpose (being barely if at all discoloured, for example). There are claimed to be 52 chambers arranged along 150 metres of tunnel, all lying nine metres below the ground surface. A ‘drift’ entrance is blocked near surface level but was reported as emerging in the church opposite the current entrance. A further (and atypical) spiral staircase within the complex is also blocked and may represent a later access from a surface property during a period of re-use.



Descending passage into the Mesnil-Domqueur *muche* Photo by Clive Penfold

The *muche* at Mesnil-Domqueur has an altogether more exciting history. Unlike Domqueur, whose *muche* has always been known, there was no oral tradition or written record of such a structure at Mesnil-Domqueur. In 2006, the village well was being subjected to its triennial inspection when it was noticed that there was a patch of masonry about a third of the way down the 60 metre structure. This was probed and found to lead to a passageway beyond. A local society then embarked on a period of exploration and over the next two years gradually progressed into the complex, removing a number of areas of infill where clay had penetrated the chalk.

Eventually the original access passage was located which led up to beneath the foundations of the village church. With permission, the passage was broken through to the surface and a three-metre pit dug within the church to effect the connection. Based on the fact that this access was overbuilt by a more recent part of the church, it is believed that the *muche* had been lost for more than 200 years.

We were met by the local Mayor and members of the local societies that had undertaken the excavations. We then entered the *muche* via the newly excavated church



Graffiti dated 1729 labelling 'Beer Store' in Mesnil-Domqueur muche - Photo by Clive Penfold

entrance. The site offers a superb opportunity for detailed archaeological investigation as the structure has been preserved almost as built without the complications of long periods of re-use. On the basis of our visit, it would seem more likely that the rooms were largely used for the storage of food and drink rather than people. This is for a number of reasons.

Firstly, there is little evidence of the detritus of human habitation. There are no apparent soot marks from lighting, or discarded artefacts. One would also have expected some organic remains if livestock had been housed underground. The overall impression was of remarkably clean walls, ceilings and even floors. Perhaps they were the equivalents, in their day, of Cold War bunkers and shelters – constructed but never put to the test?

It appeared that some of the rooms had been sealed with clay at their entrance doors. This would suggest the spaces had been used to store grain and other foodstuffs. At the entrance to many of the rooms was a flatter surface which had been used to make primitive symbols and tally marks – again perhaps indicative of secure storage rather than of occupation. At the far end of the complex we were able to see the well entrance from which the *mucho* had been originally re-entered and en route passed at least two other shafts. Whether these latter were for construction, or ventilation or a combination of the two is not clear.

The site has recently been given protected status – equivalent to UK scheduling. It is likely that much research will continue on site and hopefully this will help unlock many of the secrets of these intriguing structures. We felt privileged to be among a handful of people to have explored the site and are indebted to the Mayor and local enthusiasts for allowing our visit. Other public visits are unlikely until further archaeology has taken place.

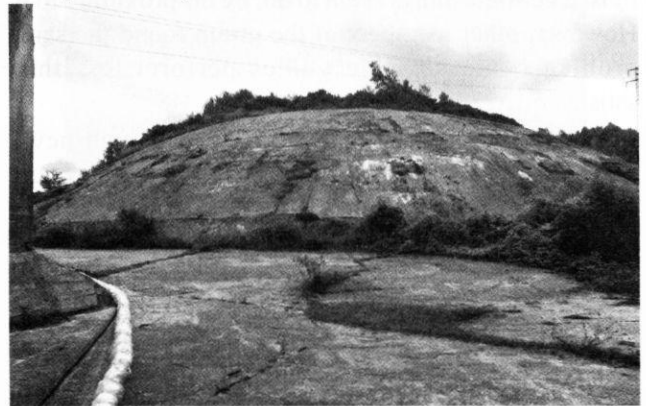
Contact details: La Maison des Muches, Domqueur, France.

IGN 1:25000 Série Bleue map 2207 E.

LA COUPOLE, WIZERNES – Sunday 3 May 2009

La Coupole, intended as a German V2 rocket assembly and launch site, is located in a large north-facing chalk pit on road D 210 at Wizernes, slightly over five kilometres southwest of St. Omer, which has a station on the main (conventional) railway from Calais to Lille. The chalk pit, and subsequent rocket site, was served by a now almost if not totally defunct rail line from St. Omer to Boulogne (part of the route has been used in recent years by rail enthusiasts' 'specials'). The line lies immediately on the north side of the D 210, and presumably once had a siding into the chalk pit; there were also sidings at Wizernes, a kilometre to the west. A couple of hundred metres further north, on the floor of the east–west valley here, runs a small river, indicating the level of the local water table in the chalk.

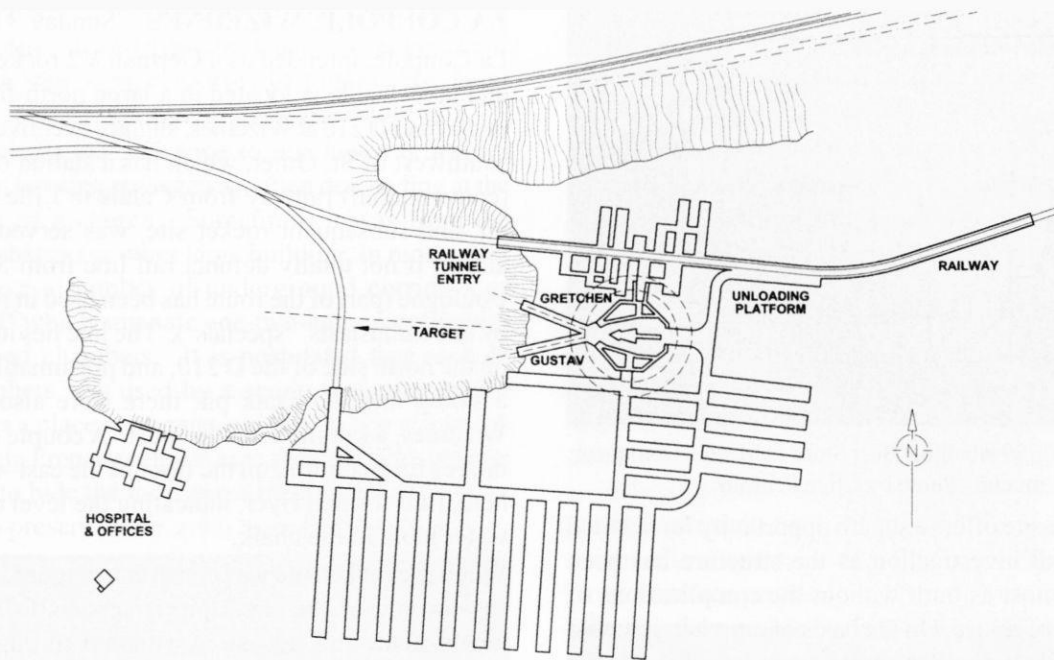
When the rocket site was constructed, tunnelled into the eastern end of the chalk pit, it appears to have had a newly-made rail access in a tunnel through the hill, presumably from a junction with the Wizernes line further east, although the Série Bleue map appears to provide no clues to the location of a junction, and we had no time to explore this question.



The dome at Wizernes in 1995 shortly before restoration began - Photo by Nick Catford

When I first visited this World War II site with Nick Catford some years ago, La Coupole had yet to be developed as a visitor attraction. What we saw then was a large abandoned chalk pit, with a securely blocked tunnel entrance at the east end below a concrete dome that we assumed had been made to sit horizontally, but which is now dramatically tilted: this is the result of RAF activity during World War II. We did find a small network of walking-height tunnels with a small building fronting them in the chalk face further west, which we were able to explore. These, thought to have had a hospital function, did not prove to be very interesting.

What is to be seen today is entirely different. There is landscaped parking, a modern reception building incorporating a café and a shop (stocking a very comprehensive and interesting range of relevant books – including, we noted, several titles published in England). Self-guided tours start here. Visitors are provided with portable audio-guides, which deliver explanations in your



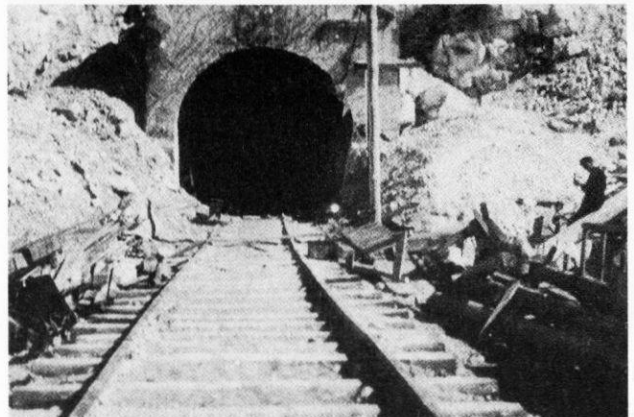
selected language at various points on the tour. Your reporter concluded that his own audio-guide suffered, as most electronic things seem to do, by his proximity to it. However, other members of the group found the same problems: the portable guides perform less than satisfactorily.

The structure, seen from the inside, although never completed, is impressive, as are the displays. You could easily spend a day taking it all in. One section explains the intended operation of the place, although as a result of RAF bombing it was abandoned, unfinished and unused. Another graphically depicts the suffering of the inhabitants of occupied France. And another is devoted to the place of the V2 rocket in the development of post-war and modern rocket technology, including the moon landings and later developments.

It is all superbly done, so you don't really need the audio gadgets. The displays are on several floors: you walk through some preliminary very large tunnels, cold and damp, before taking a lift to the top floor, inside the hill, and then descend floor by floor.

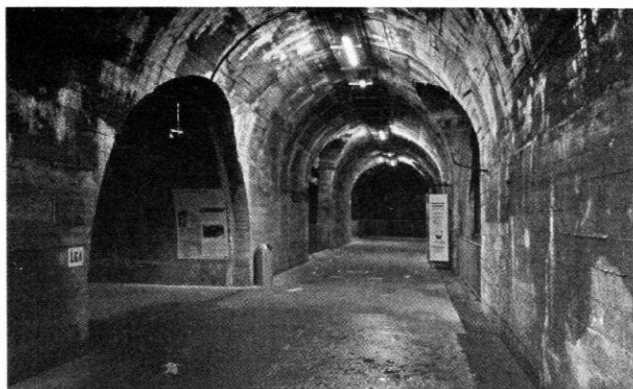
The cold and damp access tunnels mentioned pass the ends of clearly damper if not colder extensions, securely gated-off. Several of us had peered through the railing into the darkness on previous visits. It was these further tunnels we had really come to see. And we are extremely grateful to the authorities for a guided tour into the further impressively proportioned tunnels beyond the public areas. Access is normally limited to an annual bat count and occasional structural checks by the museum's technical department.

Surprisingly, they are very wet. In fact, for much of their length they are flooded to (would you believe it?) just above welly-depth! This is odd, as the little river already mentioned flowing along the valley outside is well



Main rail access in late 1944

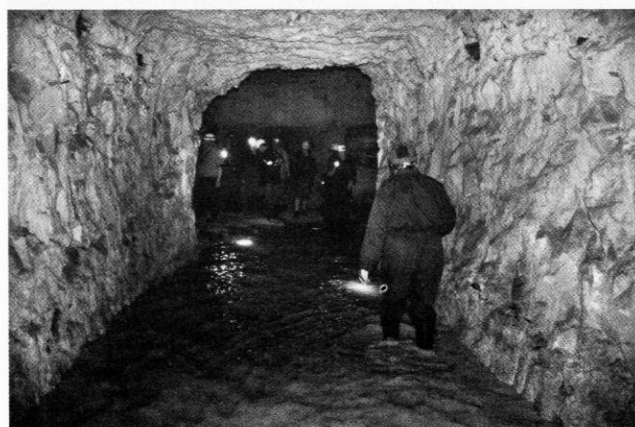
below the floor-level of these tunnels. Whether the water in the tunnels is held up by a geological quirk, or by German concrete, is not clear. Nor was the water clear, once we had advanced into it, as the tunnels have a layer of glutinous chalky mud on the floor. This slows progress. Once the first few had passed, it was impossible for those following to see what obstacles might be concealed underwater. There were, indeed, assorted bits of ironmongery and waterlogged timber to be negotiated, and at one point a deeper area into which your reporter fell, fortunately suffering nothing worse than a wetting. We had already examined a model in the public display area showing the site as intended to be completed, with not one railway tunnel portal into the chalk pit as constructed, but a total of three. We were heading westwards along what had been made of a second parallel railway tunnel (codenamed 'Hugo'), and followed this as far as the point at which all work was abandoned, as well as exploring some side tunnels. A number of roof falls prevented access into the quarry floor but at one point a ventilation pipe showed daylight was only a few metres distant.



The former railway tunnel is now the main public access into 'La Coupole'

From the public areas inwards to the abandoned works, we noted the transition from finished concrete wall-linings and tunnel-vaulting, to unfinished concrete with the 1940s shuttering still in place, to unlined chalk tunnels at full dimensions, to what looked like the pilot tunnel heading further west to the point of abandonment. Extensive timbering existed in situ in various stages of completion so the site offers many clues to the method and sequence of construction. The entire party, on the way back out, experienced the reduced visibility problem of those not at the forefront on the way in. But by then, we all knew where the pit in the floor is located. For future reference, keep to the left on the way in, and the right on the way out!

In the car park afterwards we amused the general public by emptying Wellington boots of water, and wringing out socks!



Flooded galleries at La Coupole - Photo by Clive Penfold

Contact details: La Coupole, Centre d'Histoire de la Guerre et de Fusées, Rue du Mont-à-Car, 62570 Helfaut, France.
Website: www.lacoupole.com

IGN 1:25000 Série Bleue map 2304 O (St-Omer)

LA CARRIÈRE WELLINGTON [WELLINGTON QUARRY], ARRAS – Monday 4 May

When we last visited the Wellington Quarry we found it more or less as it had remained since World War II, and we entered by special arrangement with the City Archaeologist Alain Jacques via an air-raid shelter entrance of that period.

This site has, starting in 1996, been converted into a Memorial to the Battle of Arras of 9 April 1917, and a major visitor attraction. The entrance now is by way of a capacious gently sloping walkway to a semi-subterranean reception area (with an extremely well-stocked bookstall), beyond which a guided tour descends twenty metres in a glass-sided lift within an original construction and shaft. Once underground, the tour follows a defined and lighted level pathway along which there are audio-visual presentations, with additional comment from the guide.

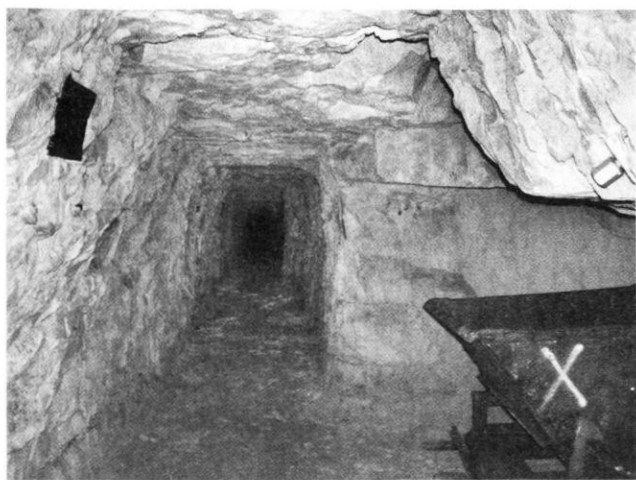
This quite large underground quarry has a ceiling height of, from memory, five metres or more. It is irregularly worked, with thick beds of unfractured chalk eminently suitable for blocks of building-stone.

Numerous chalk mines, better referred to as subterranean quarries, have long existed to the southeast of the centre of Arras – see above. They are thought to date from the Middle Ages onwards. During World War I numbers of these were linked by tunnels driven by military tunnellers,



Column where final Mass was held in Wellington Quarry before the Battle of Arras - Photo by Martin Dixon

forming two main underground corridors, the Ronville and St. Sauver tunnels, which gave a secure route to the front lines. The Ronville series were connected by New Zealand tunnellers and hence individual quarries were given names such as Auckland, Blenheim, Dunedin and Wellington. These names still survive as crudely written black painted direction signs (signs from World War II, when part of the complex was used as air-raid shelters, appear in red paint). Quarries on the St Sauveur tunnel are named after places in Britain. The entire complex sheltered 24,000 soldiers forming an attack force which surfaced at 5.30am on 9 April 1917.



Passage dug by New Zealanders connecting Wellington and Auckland Quarries under Arras - Photo by Martin Dixon

The whole museum has been superbly done, with the audio-visual components blending into the physical remains. Research into graffiti has identified some of the individual artists; for many, sadly, they were writing their own epitaphs. One of the pillars was used as a primitive altar to host a mass before the battle began (the day before the assault was Easter Sunday). The whole experience is very moving and deserves the many awards it has received. In the Visitors' Book were a number of poignant dedications, most recently from the Mayor of Wellington who had visited the previous day.

There may well still be subterranean discoveries to be made at Arras. As recently as 2000 the investigation of a gas leak in Rue St. Quentin led to the rediscovery of Casualty Clearing Station 19, nicknamed 'Thompson's Cave' after the Medical Corps colonel in charge of it.

This feature, some 800 yards behind the front line, is thought to have been sealed since the end of the First World War, and was found to contain boots cut from the feet of wounded servicemen, broken stretchers, steel helmets, billy-cans, trenching tools, empty bully-beef tins, and so forth. Personal names from the period are on the walls. More formal stencilled signs point to a former operating theatre, mortuary, and other facilities. The site has been examined by Alain Jacques, the City Archaeologist, who reportedly had been trying to locate it for some years

Contact details: La Carrière Wellington / Mémorial de la Bataille d'Arras, Rue Delétoile, 62000 ARRAS, France

Email: arras.tourisme@wanadoo.fr

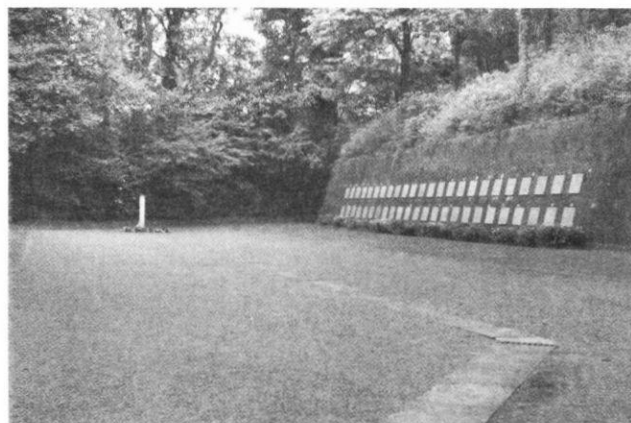
Website: <http://www.ot-arras.fr>

IGN 1:25000 Série Bleue map 2406 E (Arras)

CITADEL, ARRAS – Monday 4 May 2009

The citadel, polygonally star-shaped on plan, was built in the style of so many others based on the designs of the military engineer Sébastien le Prestre de Vauban [1633–1707]. In 1678 he was appointed *Commissionnaire-Général des Fortifications*.

Vauban's designs, of course, date from well before the advent of aerial warfare! His forts are nothing but conspicuous from the air, but from the point of view of forces at ground level they were constructed with a view to being the next best thing to invisible – quite unlike the eminently visible keeps and towers of medieval castles. Enemies approaching advanced up a gently sloping 'glacis' only to be checked on reaching the outer face of the military equivalent of a ha-ha – a masonry-lined near-vertical drop into a wide dry ditch. Anybody getting that far was immediately a sitting target for gunfire from firing positions in the central fort. Arras also has a wet moat, and drawbridge. Within the defences, the barracks and other buildings are more or less conventional or even, in the case of the chapel, elegant. The barracks, however, were designed, it was pointed out, with numerous staircases and exit doors, to allow several hundred men to be mustered on the parade ground and ready for action in the minimum of time. We were shown the melancholy scene, in the dry ditch, where 218 persons not to the liking of the occupying forces in World War II were shot: their names and occupations have, subsequently, been memorialised on the walls.



'Le Mur des Fusillés' in the moat at Arras Citadel where 218 resistance workers were shot in World War II

Photo by Clive Penfold

The Citadel is still an active military site, so we were able to visit only with special permission. Due to its status, we were sadly unable to explore beyond the many doors that temptingly led off to undoubted underground components of the defences. The occupants, the 601st Circulation Regiment, are due to move out later this year. It is not clear to what use the Citadel will then be put but hopefully public access will be possible to at least some of the site.

LE BLOCKHAUS D'ÉPERLECQUES, WATTEN – Monday 4 May 2009

The Blockhaus d'Éperlecques, an intended V2 rocket-launching site and liquid oxygen factory, has been aptly described recently, in the Royal Archaeological Institute's Newsletter, as a 'vast concrete ruin, as amazing as an ancient pyramid... hidden in Éperlecques Forest'. The

site was chosen to have good communication by both rail and canal and to be outside the range of Allied naval guns. Large amounts of power were needed and high voltage power lines were nearby. The project was codenamed Kraftwerk Nord West (KNW) and the site included protected railway unloading platforms, rocket storage, liquid oxygen production and V2 launch facilities. Construction commenced in March 1943, labour being supplied by thousands of slave workers. 120,000 tonnes of concrete were required and the raw materials were delivered by barge via the nearby canal and a narrow-gauge railway. In order to reduce the vulnerability to bombing attacks the five metre thick roof of the liquid oxygen bunker was built first and then gradually lifted into place using hydraulic jacks while the walls were built beneath. At the time the local population believed a large power station was being constructed.

The bunker was designed to launch 36 rockets per day and produce the daily requirement of 65 tonnes of liquid oxygen which reduced evaporation losses during transport. Instead of a separate liquid oxygen plant 4-storey high Heylandt compressors were intended to be installed to make the liquid oxygen and the rockets were to be assembled in the northern part of the site and moved on trolleys to be launched in the southern part.

In early April 1943, an Allied agent had mentioned "enormous trenches" being excavated at Watten. The site was first detected by photo-reconnaissance in May 1943 but its purpose was not immediately understood. At the end of May Operation Crossbow began – the Allied programme to detect and destroy the V-weapon threat. Attacks were planned for sites at Mimoyecques, Siracourt, Watten, and Wizernes which were all under construction.

The first attack on Eperlecques was on 27 August when 187 US Flying Fortresses dropped over 350 tonnes of bombs. Concrete in the northerly section had recently been poured and the devastation was immense. At some stage after these attacks the Germans decided to continue with the liquid oxygen factory alone. Although compressors were installed, the site was never operational; attacks from June 1944 using the 5 ton Tallboy are believed to have damaged the pipework. On



The Eperlecques blockhouse during construction in 1943

July 18, 1944, Hitler abandoned plans for launching V-2s from bunkers but a few days after July 18, 1944 there was some minor construction at Watten "for deception purposes", and the liquid-oxygen generators and machinery were transferred to the Mittelwerk V-2 factory at Nordhausen. The bunker was eventually captured by Canadian forces on 6 September 1944.

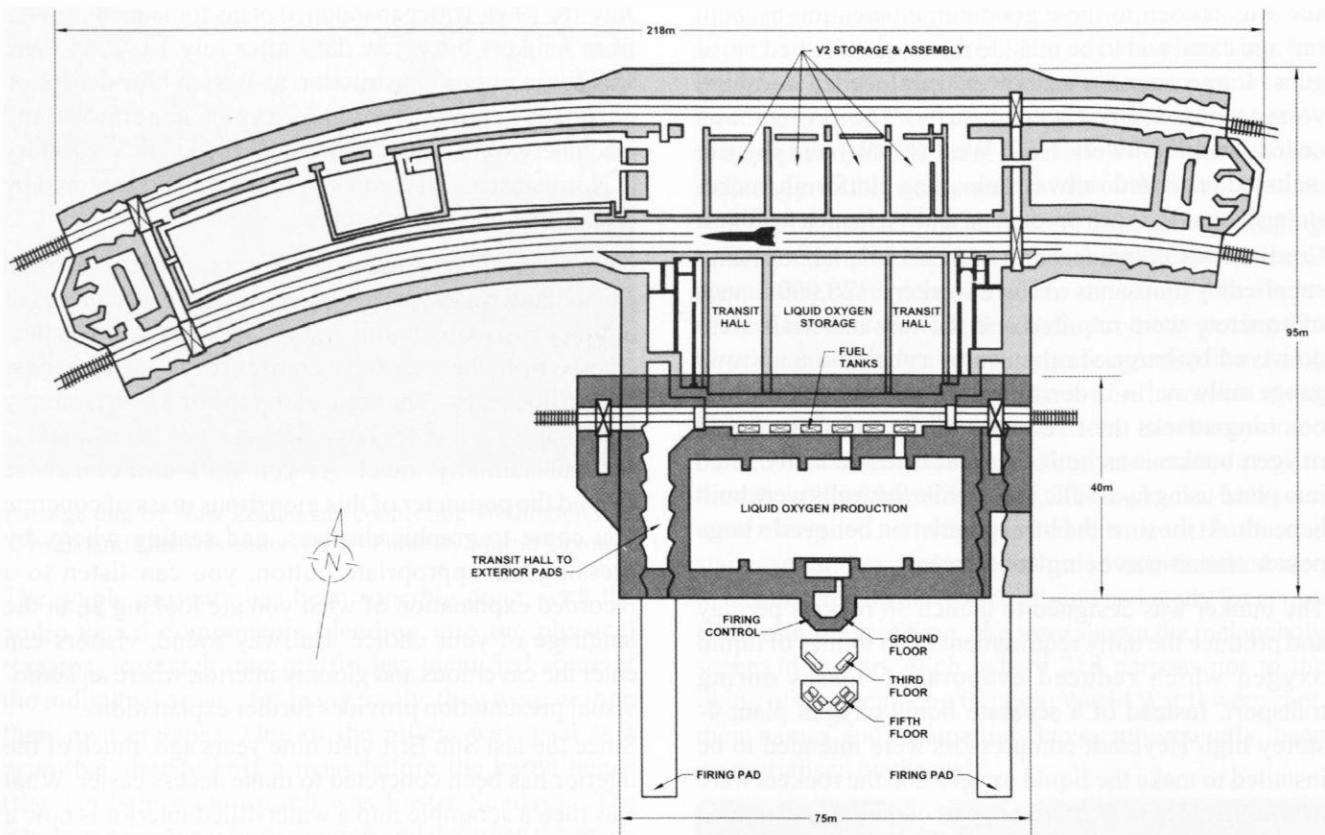
From the reception desk, and small shop, our visit followed a woodland walk, passing on the way assorted pieces of military hardware, bomb craters, and the like. You then emerge from the trees to be confronted by the vast mass of the Blockhaus. The scale of the construction is simply breathtaking – it is the largest remnant of the war and is still substantially intact. As you walk anti-clockwise around the perimeter of this monstrous mass of concrete you come to graphic displays, and seating where, by pressing the appropriate button, you can listen to a recorded explanation of what you are looking at, in the language of your choice. Halfway round, visitors can enter the cavernous and gloomy interior, where an audio-visual presentation provides further explanations.

Since the last Sub Brit visit nine years ago, much of the interior has been concreted to make access easier. What was then a scramble into a water-filled interior is now a gentle descent into the dry. Inside there are exhibits showing how the various parts of the site would have worked together. After automated unloading, the rockets would have been fuelled and calibrated in the safety of the bunker before emerging vertically to be fired towards London.



The Eperlecques blockhouse in 1996 - Photo by Nick Catford

Emerging back into daylight, there is an authentic but relocated V1 launch ramp on display. There are also some displays showing the conditions under which the forced labour force lived. A huge lake now occupies the crater caused by a Tallboy near-miss. Recognising the vulnerability of fixed launch pads, all V2 launches eventually took place from mobile units around The Hague. Around 1,300 V2s were launched at the UK (mainly at London) and many more at Antwerp. The warhead of the V2 was similar to the V1 but the death



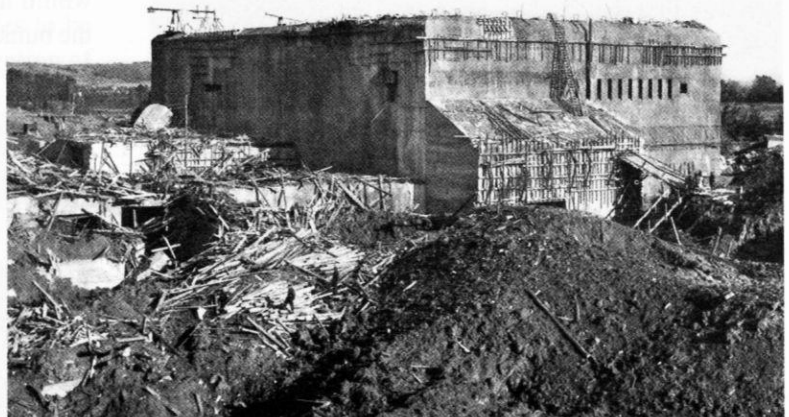
Plan of Eperlecques blockhouse

and injury rate was around twice as high. Unlike the doodlebug, the V2 arrived with no warning at around four times the speed of sound. As well as the expensive single use delivery vehicle, the V2 needed around 3 tonnes of alcohol and 5 tonnes of liquid oxygen to deliver its one tonne payload. It was the most expensive weapon developed by the Germans and through slave labour caused the death of more of those who built it than it did in action.

Contact details: Le Blockhaus D'Éperlecques, Rue du Fort Vesques, 62910 Éperlecques.

Website: www.leblockhaus.com

IGN 1:25000 Série Bleue map 2303 O (Watten)



The Eperlecques site was captured by Canadian troops on September 6, 1944. In early 1945, the American military tested new bombs on the bunker.

As can be seen here there was considerable damage around the blockhouse although the blockhouse itself received little damage.

THANKS

Our indebtedness for the superb professionalism, and indeed humanity (not the same thing), of our talented leadership team cannot be over-emphasised! Although some of us had seen at least some of the sites before, there were interesting and even radical developments, and new details always to be noticed. And we had, in Angus, a very congenial and helpful coach driver. We were pleased he joined us for evening meals, and hope to travel with him again.

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Plate Rails in the Surrey Firestone Quarries

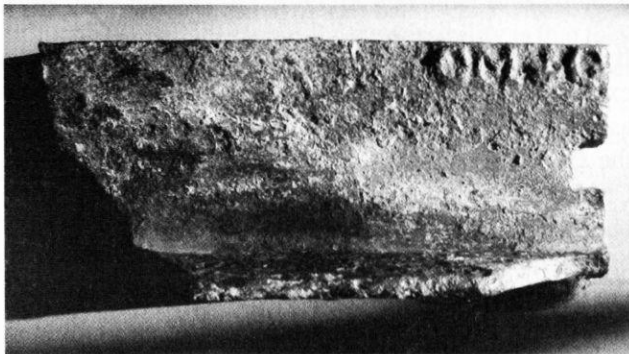
Peter Burgess

This article is a compilation and update of papers first published in Proceedings of Croydon Nat. Hist. & Scientific Soc. 18(4), March 1994 (Ref. 1), and in the journal of the Wealden Cave & Mine Society, "Cave & Quarry", Issue 5 (2008) (Ref. 2, Ref. 3). All photographs and illustrations are by the author unless otherwise stated.

The use of cast-iron plate rails in the Merstham and Godstone quarries has been noted and described in a number of publications. Investigations in recent years have brought new evidence to light concerning the origins of some of the plates, and the extent of the network of lines, in the Godstone Hill quarries, in other nearby workings, and at Merstham.

Background

The Upper Greensand formation in East Surrey has been exploited for its beds of building stone, from medieval times into the twentieth century. Although more recently worked for the soft hearthstone that is also found there,



A fragment of a Type 2 plate rail found in Godstone quarries. Clearly marked with the lettering CM&G, this find provided the proof that former CM&GIR plate rails were used in the Godstone quarries.

the Upper Greensand was primarily a source of firestone, as the building material was known. The quarries were nearly always located underground, the workings being developed on the pillar and stall system. By this means, up to 80 percent of the stone could be, and was removed from the workings at Reigate, Merstham, Chaldon and Godstone. The Godstone quarries do not seem to have been developed significantly until the late seventeenth century. Quarrying here reached a peak in the nineteenth century, when the introduction of cast-iron plateways was deemed necessary, probably on account of the extent of the workings, and the increasing weight of the stone blocks removed from the quarries.

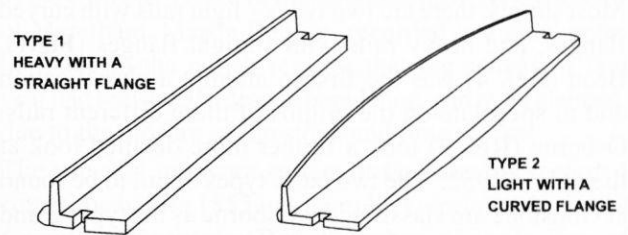


Figure 1. The two basic types of plate rail used in the Godstone quarries

Although underground, the workings are historically referred to as quarries, and not mines. Traditionally, quarries were sources of stone for building or similar purposes and their location, on or under the surface, was immaterial.

The term *mine* was usually reserved for metal ore workings, or similar, also regardless of their position on or under the surface. The term *mine* for underground extraction sites seems to have evolved during the latter part of the nineteenth century. The term *quarry* is therefore used in this paper, as being the normal term for much of the period of activity at Merstham and Godstone.

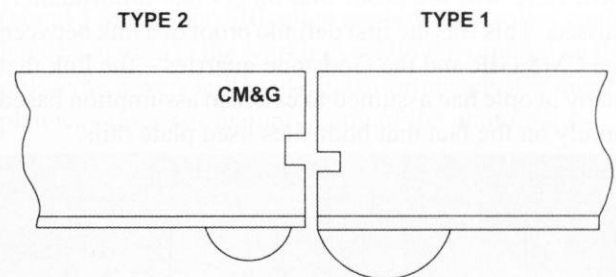


Figure 2. The two types of plate rail illustrating misalignment of fixing slots.



Section of plateway track with Type 1 rails, in Godstone quarries.
Photo by Nick Catford

Origins – Rails at the Godstone Quarries

It has long been recognised that a number of different types of plate rail exist in the Godstone Hill workings. Most simply, there are two types – light rails with curved flanges, and heavy rails with straight flanges (**Fig.1**). Bean (**Ref. 4**) was the first to attempt a classification and to speculate on the origins of these different rails. Osborne (**Ref. 5**) took a further more detailed look at the rails in 1982. The two basic types of rail to be found at Godstone are classified by Osborne as his types 3 and 4. His types 5, 6 and 7 are probably variants of the two basic types. Both Bean and Osborne concluded that there was no evidence that the rails were acquired from the Croydon Merstham and Godstone Iron Railway (CM&GIR), which also used cast-iron plate rails throughout its nine or so miles, and which was originally built as a double-track plateway.

By 1986 this had become the generally accepted view amongst those studying the Surrey firestone workings. In that year, a short fragment of rail was found in the Godstone Hill workings, and passed to me for cleaning and inclusion in the Croydon Natural History and Scientific Society (CNHSS) museum collection of quarry artefacts. As I cleaned the object, I was surprised, to say the least, to find at one end of the rail, the letters CM&G clearly cast. Here was the proof that others had unfortunately missed. This was the first definite proof of a link between the CM&GIR and the Godstone quarries – the link that many people had assumed to exist, an assumption based purely on the fact that both sites used plate rails.

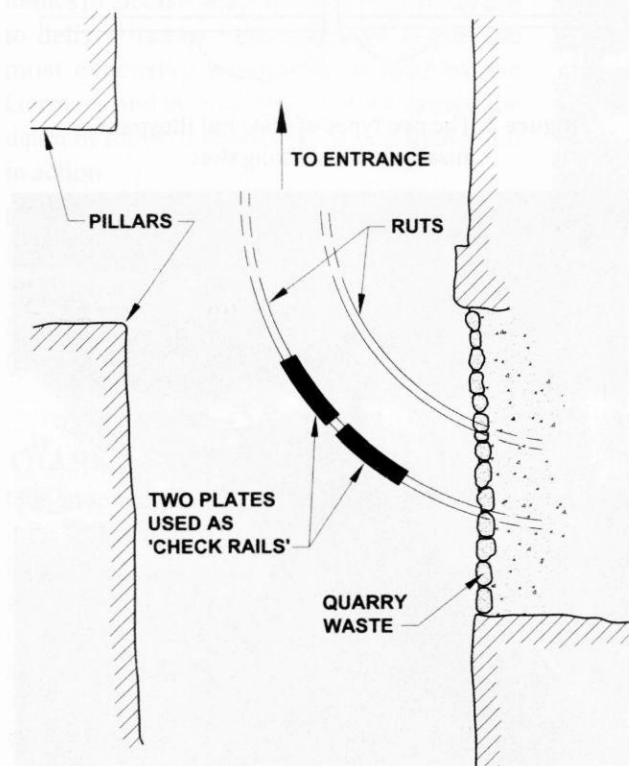


Figure 3. Sketch of rut and plate layout in Jones's workings.

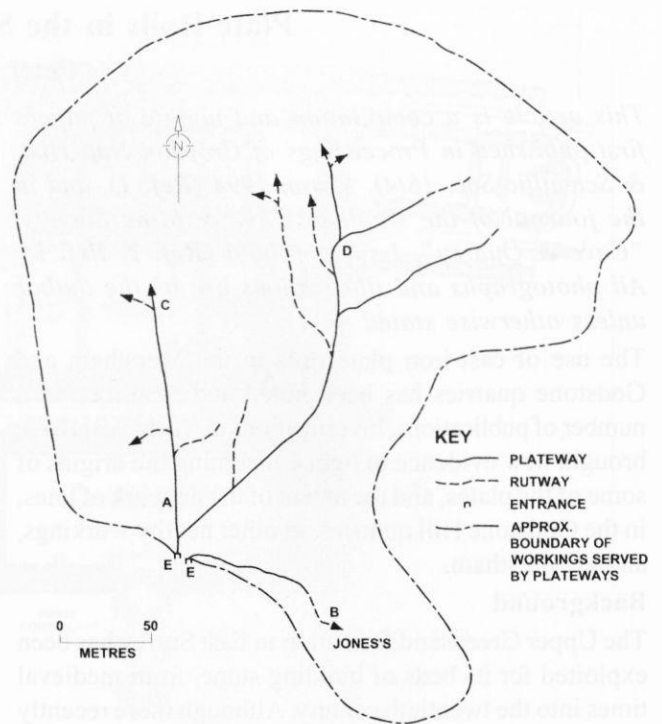


Figure 4. Godstone Hill quarry showing known plateway and rutway routes

It should be pointed out that the CM&GIR was never extended beyond Merstham to Reigate or to Godstone, as originally planned, and was never intended to serve the Godstone quarries anyway. Opened in 1805, the CM&GIR ran from the lime works and nearby stone quarries at Merstham to Croydon, where it made an end-on junction with the Surrey Iron Railway, which ran to the Thames at Wandsworth. The CM&GIR was effectively out of use when the London and Brighton Railway was completed in 1841. The old line was probably last used to supply materials for the new railway. A detailed account of the CM&GIR and the Surrey Iron Railway has been published by Bayliss (**Ref. 6**), and an analysis of the history of the Merstham terminus of the CM&GIR has been completed by Sowan (**Ref. 7**).

Following the discovery of the lettered rail fragment, it was clear that a close inspection of other plate rails, both *in situ* and in the CNHSS collection, was required. A project to clean, inspect, and treat the museum rails was initiated, starting with those with curved flanges. No rail was found with lettering as clear as that on the fragment first cleaned, but a number of rails clearly had the well-worn remains of lettering at both ends – CM&G at one end and RYCo at the other. Others, however, quite clearly had never had any lettering on their running surfaces. What was apparent was the high degree of wear to which the rails had been subjected.

The relevant areas of the running surfaces of *in situ* rails were also cleaned and inspected, and a similar picture emerged, with marked and unmarked rails coming to light. All the rails showed signs of substantial wear. From inspecting the rails *in situ*, it was clear that the

curved rails had in several cases been laid as replacements for heavier, straight-flanged originals, though in some places, continuous lines of curved-flange rails had been laid, possibly where no earlier rails had been fixed.

The slots in the ends of the curved and straight rails (for securing the rails with spikes) are of two sizes and do not match when aligning two rails of different types. The curved-flange rails have large slots near the centre of the running surface, and the straight-flanged rails have smaller slots nearer the flange. Consequently, when the rails are laid end to end, it would be difficult to spike two different adjacent rails satisfactorily to the floor of the quarry (Fig 2). This points to the use in places of the curved-flange rails as replacements for older, broken or worn straight-flanged rails, and, as suggested by Osborne, as extensions to the original network of straight-flanged rails. However, as all the different rails were quite possibly obtained at the same time, it is also conceivable that the quarrymen deliberately laid the same type of rails together, only mixing them later through the need for repair or replacement.

How did a number of CM&GIR and other rails come to be in the Godstone quarries? One possibility is that they were bought in 1842 when the CM&GIR rails and sleeper blocks were auctioned in Croydon following acquisition by the London and Brighton Railway. Alternatively the rails were obtained by a dealer who supplied them to the quarry operators. It is also conceivable that the rails were obtained at an earlier date directly from the CM&GIR as traffic declined, and the company abandoned the use of one line of its double track, or possibly from the operator of the Merstham lime works. Why do some of the curved-flange rails not bear the CM&GIR lettering? It is not known whether all CM&GIR rails were so marked. It is reasonable to assume that rails bought for the line when it was built were identified with the company lettering. Later, smaller batches bought for line repairs may not have been so labelled, as the original patterns may have been lost, and unlabelled rails would have been cheaper if cast from a 'standard' pattern.

If all the rails were bought from a dealer or other intermediary, rails recovered from other old tramways may have been available and this may explain the presence of the straight-flanged heavy rails, which are not believed to have originated from the CM&GIR. However, we may not need to look too far to find a possible source for the Type 1 rails. A rail with similar proportions to a Type 1 rail, if not actually the same, has been recorded by divers within a flooded underground quarry shaft at Merstham pits, a site closely connected with the CM&GIR, and described later in this paper. As the Type 1 rails are of a different type to those used by the CM&GIR, and not entirely compatible with them, the single example of what may be a Type 1 rail at Merstham could be evidence of a different type of

plateway being used there, possibly within the confines of the chalk pit and lime works, but contemporary with the CM&GIR, and recovered for sale at the same time as the CM&GIR rails, or thereabouts. In 1831, the Rector of Merstham, Martin Benson, recorded in annual notes he made in the parish register that the census of that year had registered a drop in population, partly, he claimed, due to the closure of the stone and lime works.

The use of a tramway system at Godstone is recorded sometime before 1855 in a pamphlet reprinted from *The Croydon Chronicle* (Ref. 8), when a single line of tramway rails is described entering the principal entrance at Godstone Hill. In 1861, Fenton (Ref. 9) described springs rising "at the lower end of the three tramways which passed down the quarries". By 1886, the Godstone tramways were little used, according to Dickinson's report of that year (Ref. 10), which, though mentioning the tramways, suggests that the quarrymen were resorting to dragging stone blocks along the ground using horses. However, it is likely that at least some of the plateway system was still being used at the turn of the century, as photographs published in 1901, with an account of the quarrying activity at Godstone, show a low trolley being used to remove large blocks of stone from the workings (Ref. 10). This trolley had a low, sturdy deck, with four iron wheels at a gauge comparable to that of the plateway (about 3 feet). It is difficult to see how this trolley could have been used in the workings without it running on the rails, which were still in place. Unfortunately, the quarry plateway does not feature in any of the photographs.



A round rut formed either for or by the wheels of a stone trolley has been later widened to accommodate plate rails, held in place by wooden blocks and iron spikes.

Location "C" in Figure 4.

Further Discoveries

After closure, the Godstone Hill quarry was used as an underground mushroom farm in the first few decades of the twentieth century. The quarry floor in many areas is now obscured by the remains of mushroom beds and levelled quarry waste. Consequently, to determine the true extent of the

plateway system in the surviving galleries without a considerable amount of destructive excavation, it was necessary to use a metal detector. This proved to be very successful, and is an example of the beneficial use of such devices in archaeological work. Two hitherto unknown lines of rails were quickly discovered. Two trial excavations confirmed the presence of heavy, straight-flanged rails on both lines, under several inches of highly compacted quarry waste and mushroom bed material (points "A" and "B" on **Fig. 4**).

One line runs from the principal quarry entrance northwards, more or less without deviation, into the now inaccessible workings to the north of a large roof-fall. A short length of this line at the current most northerly point (point "C" on **Fig. 4**) has recently been inspected, and curved-flange rails were found, one bearing very faint CM&G lettering. The other line runs from a secondary, brick-arched entrance, close to the principal entrance, into what is known as Jones' Quarry – an up-dip working on the southern side of the system. The inner end of this second tramway has few rails in place, possibly as none were ever laid, the truck wheels running in grooves either worn or purposely cut in the stone floor. The two innermost rails located are isolated from the continuous lines found nearer the entrance, and upon excavation were found to have been laid on the outside of a curve where the ruts in the floor divert from the present passage alignment and disappear intriguingly into a section now backfilled and sealed up with drystone walling (point "B" on **Fig. 4**, and sketched in **Fig. 3**). As this wall was placed on top of the quarry waste and mushroom compost on the floor, it is apparent that it was built during a period of mushroom cultivation.

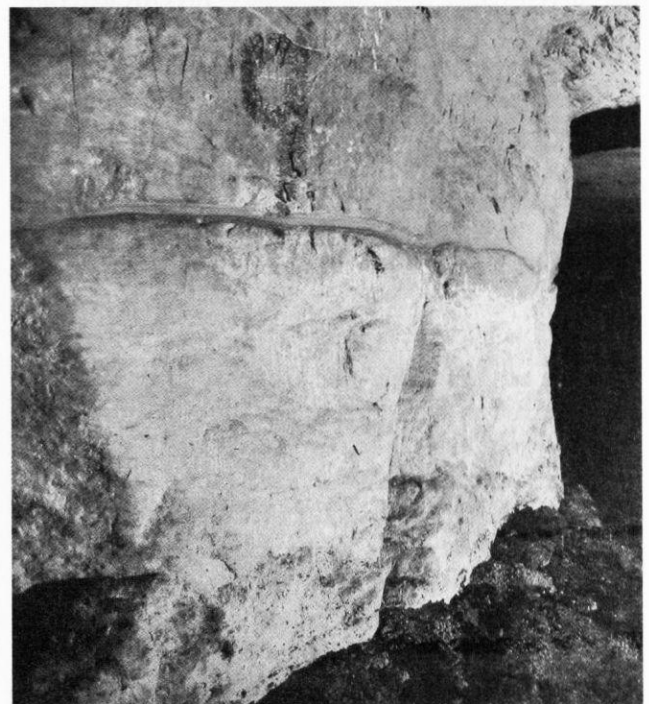
The continuation of tramways as rutways elsewhere at Godstone was already known, as was the laying of the rails over existing rutways, but the use of isolated plates to prevent derailing has not been seen elsewhere. It has still to be proven whether the ruts were a deliberate extension to the plateway system, or were generated incidentally by the volume of traffic along main haulage routes. In a few places it can be seen that the ruts preceded the use of plate rails, which were laid in the ruts to ease traffic in the more heavily used parts of the system, near the entrances. Where rails have been removed in the past, the slots thus exposed are seen to have been deliberately cut to contain the rails. In places it can be seen that earlier ruts have been widened to accommodate the iron rails. Where tramways or rutways pass in an east to west direction, along the strike direction of the stone beds, the more southerly of the rails or ruts is sometimes set more deeply into the floor, since this would have kept the stone trolley level and less inclined to drift northwards, the direction of dip. The known extent of the plateway/rutway system in Godstone Hill workings is shown in **Fig. 4**.

It has been confirmed that in some instances, plate rails were preceded by rutways. At a junction at the most northerly point accessible due north of the 'Roadside' entrance (location "C"), evidence was found to confirm this.

At this junction, a line of rails has survived *in situ*, and slots have been cut into the floor into a side gallery. The slots in this side gallery have clear evidence of once having contained plate rails, including a surviving wooden block with a fixing spike still in place. In the base of the rut, a smooth-worn groove shows where the trolley wheels have run at a time before the plate rails were introduced. The use of rutways is a very poorly researched subject. Two coastal sites where such features may be inspected are the Purbeck cliff quarries, where ruts may be seen in the wave-cut platform running from the base of the cliffs to points where boats could tie up, and the coast of northeast Yorkshire where ruts occur in a similar situation, associated with the alum industry, and the working of Cleveland ironstone. Owen, in describing the Yorkshire features (**Ref. 12**), speculates that the ruts were deliberately cut, and that they would have provided assistance when moving carts across the foreshore in darkness. The application of such a theory to the underground environment is obvious.

The "Rope" Grooves

Some rock pillars left to provide support for the roof of the Godstone workings bear deep incisions between half and two-thirds of the way up. These incisions have been previously cited as evidence of rope haulage being used to move loads of stone. Close inspection has revealed features that contradict this interpretation. Most of these grooves seem to be associated with a plateway or rutway



Sinuous grooves cut into a quarry pillar by the ends of whippetrees, Godstone quarries

passing alongside. This suggests an origin linked to haulage methods. However, the geometry of the grooves rules out the possibility of their being caused solely, if at all, by ropes.

There are two reasons for believing otherwise. Firstly, the grooves are not always straight, and in one or two cases have a marked sinuous profile, with two grooves branching from one. A tight rope would produce straight grooves. The second, and less obvious feature, is the profile of the groove when viewed, were it possible, from directly above. The shape of many pillars in Godstone workings is not a simple rectangle. There are often internal angles where the profile of a pillar has been modified to allow clearance for haulage. Where a groove crosses such an alcove in the pillar, it is incised more deeply than could have been produced by a rope rubbing at a tangent to the pillar.

Whatever caused the grooves had a certain amount of lateral freedom to allow it to move in and out as it followed the profile of the pillar. It is possible that the grooves were worn by whippletrees (otherwise known as swingletrees, or whippins): that part of a harness which lies between the horse and its load, and which takes the form of a bar to which the traces either side of the horse were attached. Whippletrees were also used between horses when two or more animals were being used in a train. Three horses harnessed in such a way are illustrated in Adam's account of the Godstone workings in 1901 (Ref. 11).

The Plateway Junctions

There are four known plateway junctions in the Godstone Hill workings. Two of these have been excavated to establish their *modus operandi* (located at points "C" and "D" on Fig. 4, "D" being illustrated in detail in Fig. 5, the excavation plan). Unfortunately, the first junction selected, "D", had few plate rails *in situ*, and little was learnt. A curious shallow saucer-shaped depression is obviously of some significance, and one section of the junction had no rails originally laid in it. It seems that there may once have been a mechanism in the form of a movable flange, as receptive slots for it in the open and closed positions were uncovered to one side of the aforementioned depression. However, unless a plate were actually missing from the working system, only one of these slots could have been used, as the other would have been covered by the plate in question. If no plate had been laid here, the ride would have been very rough. One plate seems to have been deliberately broken to make it fit.

A number of wooden blocks with and without iron spikes were uncovered, but no clear function for them has been suggested, other than for holding down the plates, since removed, which only accounts for some of the spikes. The overall impression is one of crudeness: the available materials were adapted to provide a basic, working system. Osborne recovered a heavy plate with a very low flange, fitted at one of the other junctions, and surmised that it was a special plate designed to allow wheels to be bumped over from one line to another. The junction excavated had no such rail, and no obvious place where such a rail could have been fitted.

It is easy to assume that the locations where two separate lines of rails met were junctions for routes that were both being actively used at the same time. It is likely that in some locations, this was not the case, and that the two routes in question were actually used at different times,

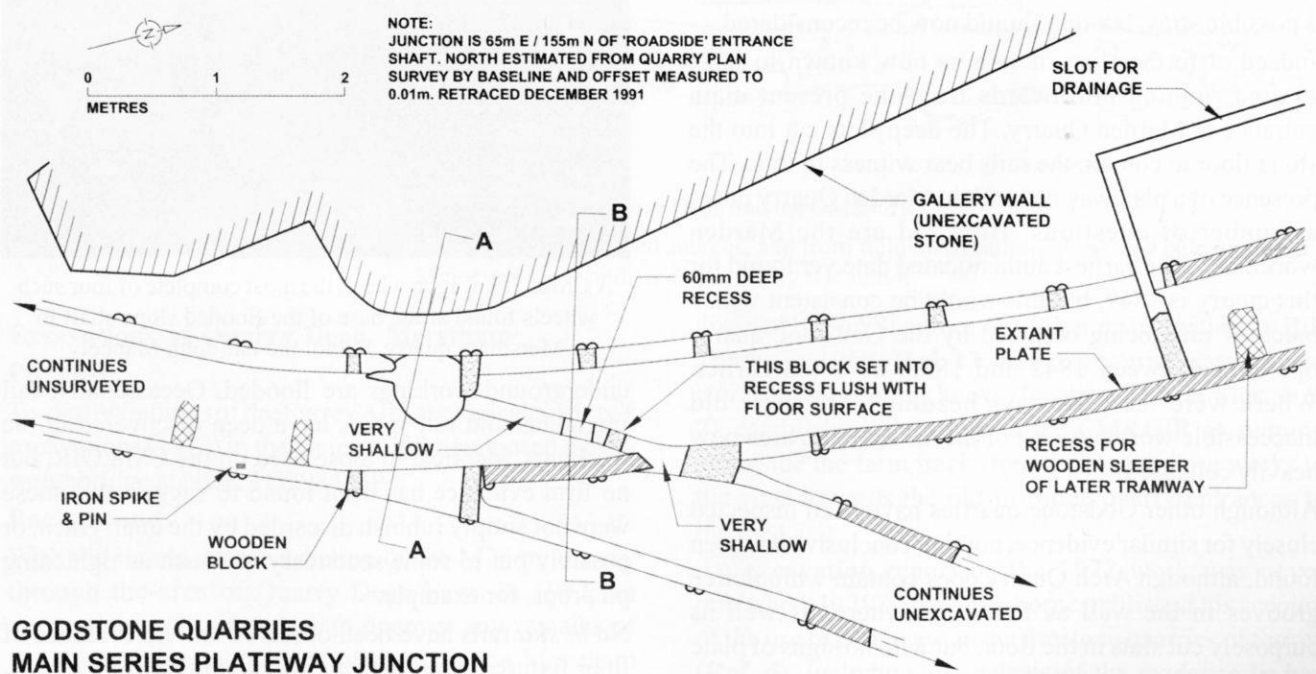


Figure 5. Excavated plateway junction. Godstone Hill quarries.

one being abandoned, and then the second route being developed later. In these circumstances, there would be no need to provide a mechanism to direct traffic one way or the other. At such junctions, the question is: which route came first?

The picture can, of course, be more complex, with a period when both routes might have been used, before one was abandoned. The rails on the abandoned route could then be lifted and either reused or scrapped, or left in place. Each junction is different, so each solution as to how to get the stone trolley onto the right line might differ, possibly involving no more than temporarily laid lengths of timber or plate rail.

The Marden Quarry Plateway

In 1987, during a visit to nearby Marden Quarry, grooves in the pillar corners were noticed, similar to those in the workings at Godstone Hill. Excavation in the waste on the quarry floor revealed a slot cut to take a line of plate rails. The slot contained recesses showing that the rails were laid with flanges on the outside, as described above. The passage in question runs from the quarry entrance towards the ventilation shaft, believed to have been built by mushroom growers. The entrance end of this passage is now blocked, and the passage itself is only accessible today by a circuitous route underground.

Searching the quarry with a metal detector led to the discovery of one buried plate rail fragment, with a curved flange, but no *in situ* rails. Small portions of broken rail were also noticed in use as wedges to tighten up roof supports, constructed with stone blocks. This type of pillar may only be found in the older building stone sections of the Godstone workings. This suggests the availability of broken rails for such a purpose at quite an early date in the lifetime of this quarry. A loose straight-flanged rail found in Marden Quarry was interpreted by Osborne as a possible stray, but this should now be reconsidered.

Indeed, a further line of rails is now known to have existed running northwards from the present main entrance to Marden Quarry. The deep slots cut into the stone floor to contain the rails bear witness to this. The presence of a plateway network in Marden Quarry poses a number of questions. How old are the Marden workings? The earliest authenticated date yet found for this quarry is 1849, but this would be consistent with a batch of rails being obtained by the Godstone quarry operators between 1842 and 1855, as noted earlier. Where were the plateways heading? Are there old inaccessible workings east of the air shaft, an area now heavily collapsed?

Although other Godstone quarries have been inspected closely for similar evidence, nothing conclusive has been found, although Arch Quarry does contain whippetree grooves in the wall as found elsewhere, as well as purposely cut slots in the floor, but with no signs of plate rails having been installed in them.



Plate rail found in the flooded slope shaft at Merstham. This rail is very similar to Type 1 rails, as observed in the Godstone quarries. Photo: the late John Maneely

Plateways at Merstham Quarry

The CM&GIR, completed in 1805, terminated near Merstham, several miles west of the Godstone quarries. There is a close connection between known quarry workings at Quarry Dean, Merstham, and plateways, as it is now known that the stone from this quarry was transported northwards to Croydon by way of the CM&GIR, and thence along either the Surrey Iron Railway to the Thames at Wandsworth, or down the Croydon Canal to Deptford. Whether plate rails were deliberately laid underground at Merstham has yet to be proved conclusively. The most likely place for this to have happened was in a slope shaft, now partly filled and covered over, and only accessible to divers since the



A CM&GIR wagon wheel, the most complete of four such wheels found at the base of the flooded slope shaft in Merstham quarry. Photo: the late John Maneely

underground workings are flooded. Occasionally, rail fragments and rail spikes have been discovered in the workings, identical to those used on the CM&GIR, but no firm evidence has been found to suggest that these were not simply rubbish discarded by the quarrymen, or possibly put to some secondary use such as tightening pit props, for example.

No *in situ* rails have been observed and no evidence of floor fixtures to retain them, whether in the form of ruts, stone sleeper blocks, wooden sleepers or spikes set into

the quarry floor. Plate rails and typical plateway wagon wheels, along with a number of CM&GIR stone sleeper blocks, have been found and recorded at the flooded base of the slope shaft, but they bear all the evidence of being there simply because they were thrown down the shaft when it was abandoned and buried.

The slope shaft is known to have been constructed by the quarry lessee, Messrs Jolliffe and Banks, and equipped with a steam engine in 1809. It is likely to have been equipped with rails of some kind, but none are visible in place today, according to those that have seen the shaft.

The quarry and its shaft were open between 1809 and 1820, from the time when a drainage level successfully lowered the local groundwater level until the year when the quarry was abandoned and the drainage tunnel was blocked.

Productive research on the surface at Quarry Dean has, however, provided some clues as to how part of the quarry was served by the southernmost end of the CM&GIR. The following report, first published by Wealden Cave & Mine Society in "Cave & Quarry" 5, (Ref. 3) provides the most recent thoughts on this matter.

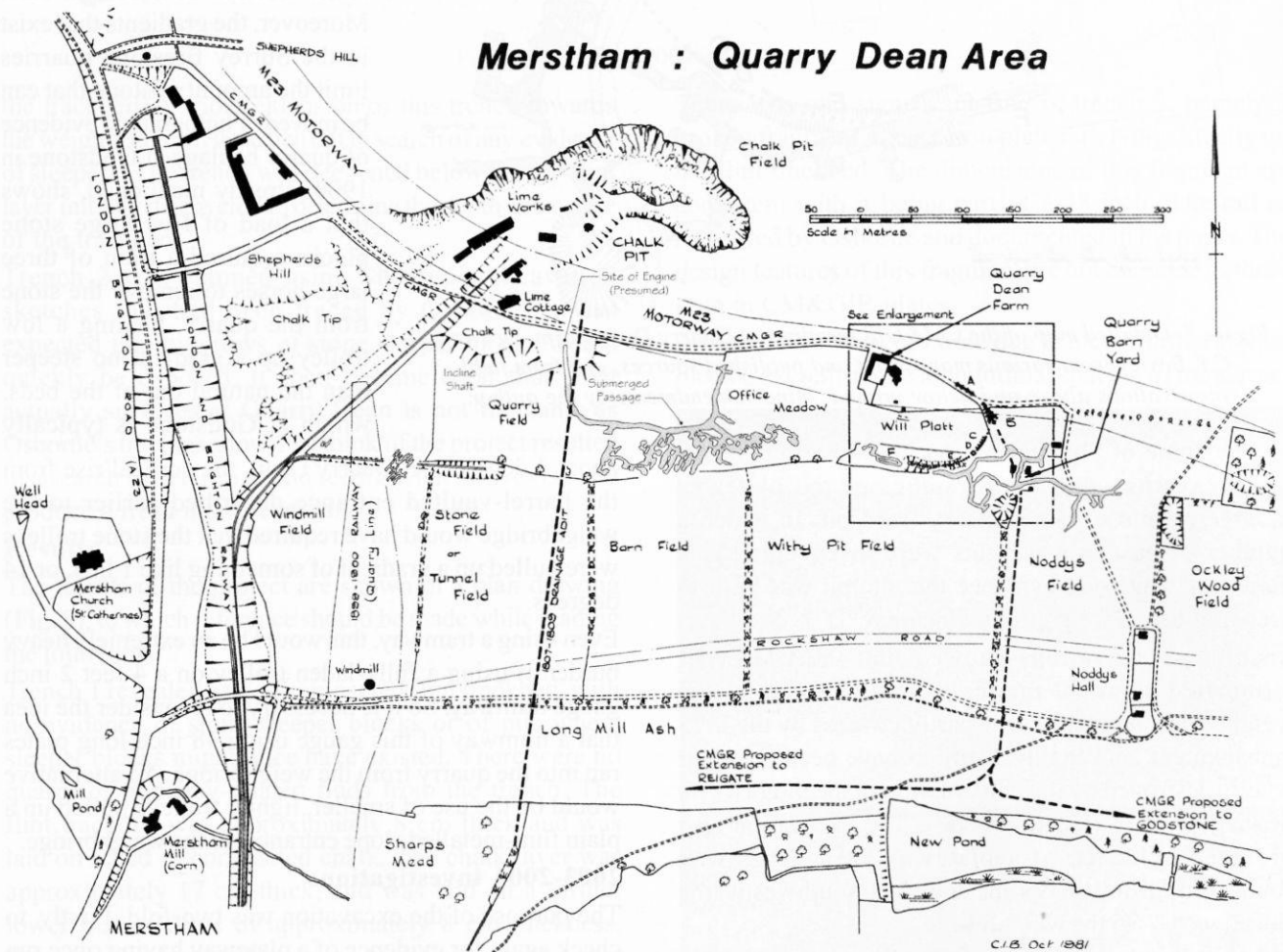


Figure 6. Map of Quarry Dean and the CM&GIR

Drawn by C.I. Bayley from various manuscript and published sources, and from field observations above and below ground. Minor additions and amendments by the author.

Excavations at Quarry Dean, Merstham

Purpose

To clarify findings of the Surrey Archaeological Society's excavations (1972) in the vicinity of the supposed quarry weighbridge at NGR TQ29845392.

Background

With the imminent construction of the M23 motorway through the area of Quarry Dean Farm in 1972, an excavation was undertaken to uncover any remains of the suspected terminus area of the Croydon Merstham and Godstone Iron Railway (CM&GIR). This work was

directed by Jim Shenton. An earlier investigation by Bill Tharby in 1968 (Ref. 13) had discovered plate rails *in situ* east of the farm house (location "A" on Figs. 6 & 7), establishing the route of the CM&GIR as running alongside the farm track from the former lime works to the west towards the old firestone quarry entrances to the east.

An excavation report on the 1972 work was never published. In 1982 Bruce Osborne published his account of the use of plateways in the firestone quarries of Surrey (Ref. 5), including an analysis of the evidence he had collated on the Quarry Dean area. Osborne was able to

C.M.G.R. Terminus : Detail

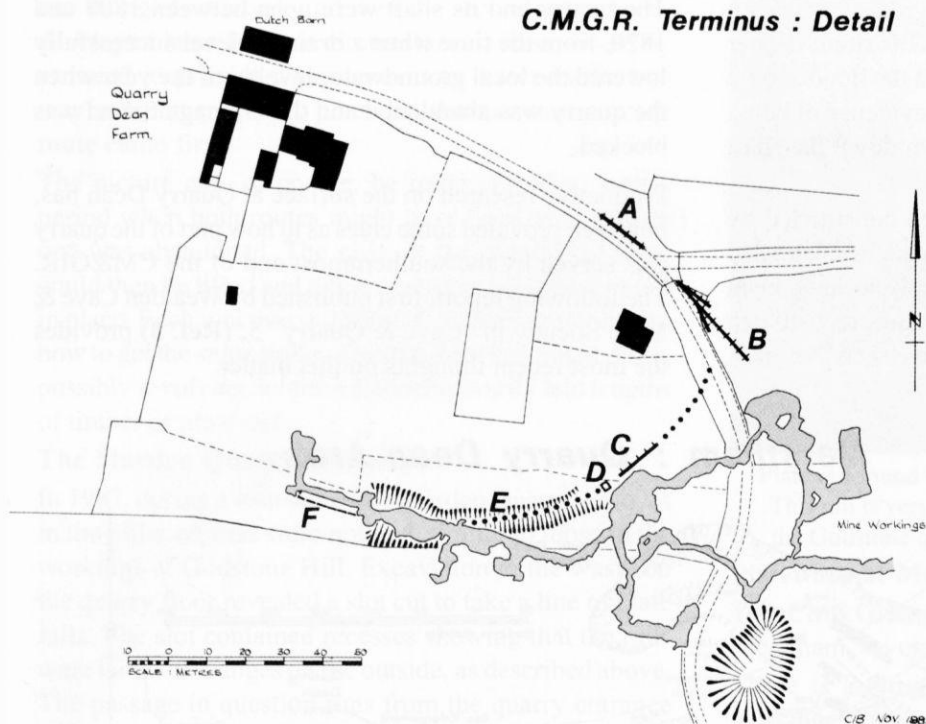


Figure 7. Detailed map of the CM&GIR terminus at Quarry Dean Farm. Drawn by C.I. Bayley from various manuscript and published sources, and from field observations above and below ground. Minor amendments by the author.

inspect some of Shenton's notes and some finds from the excavation, and took tracings of the plateway discoveries close to a masonry-lined pit, in which a number of cast-iron weights were discovered. This discovery was good evidence that the pit was built to accommodate a weighbridge (location "D").

Shenton's excavations showed that the CM&GIR terminated some 50 metres to the northeast of the weighbridge, at a point now partly covered by the M23 embankment, and highly likely to have been partly or wholly destroyed by the construction of the motorway's drainage system (location "B"). The excavation also provided evidence of a plateway branching away southwards from this point and then southwestwards (location "C") to the weighbridge.

Two rails were found *in situ*, below the level of the CM&GIR, and 48 inches in length, not 36 inches which was the standard used on the CM&GIR. Shenton detected no stone sleeper blocks west of the weighbridge. Osborne concluded that this lower tramway predated the CM&GIR and ran beyond the weighbridge, then down an incline (location "E") into a surviving stone-lined barrel vault (location "F") into the underground quarry workings. This slope shaft is not that discovered by divers further east, very likely predates it, and has a much lower gradient. Osborne proposed that west of the weighbridge a plateway may have been laid into the quarry on wooden sleepers of which no evidence has survived.

Doubts over earlier interpretations

When considering what survives at Quarry Dean, and when interpreting the evidence, it is important to consider

the wider picture of the quarrying operations. Shenton revealed a gauge of 4 feet 2 inches from flange to flange, both for the CM&GIR track and the suspected older tramway. The plateways underground in the equivalent firestone quarries at Godstone have a gauge of 3 feet only, and for a good reason. The galleries can only accommodate stone trolleys of a certain size. Moreover, the gradients that exist in the Surrey firestone quarries limit the amount of stone that can be moved. Photographic evidence of quarry haulage at Godstone in 1900, already mentioned, shows that a load of five large stone blocks required a train of three large horses to remove the stone from the quarry, hauling a low trolley up a gradient no steeper than the natural dip of the beds, which at Godstone is typically

about 4 degrees. At Quarry Dean, the vertical rise from the barrel-vaulted entrance described earlier to the weighbridge would have required that the stone trolleys were pulled up a gradient of something like 1 in 4, or 14 degrees.

Even using a tramway, this would be an extremely heavy burden if using a fully-laden trolley on a 4 feet 2 inch gauge tramway. So it is necessary to reconsider the idea that a tramway of this gauge using 48 inch long plates ran into the quarry from the weighbridge. An alternative would be the use of smaller, lighter trolleys pulled up a plain flint-metalled slope entrance, to the weighbridge.

2003-2004 investigations

The purpose of the excavation was two-fold. Firstly, to check again for evidence of a plateway having once run from the weighbridge westwards down the slope cutting into the barrel vault. Secondly, to uncover the 1972 discoveries and check the gauge and plate length used on the track immediately east of the weighbridge (location "C"). The investigations were confined to the area directly either side of the weighbridge.

Trench 1 was west of the weighbridge, to check for evidence of a plateway.

Trench 2 was east of the weighbridge to expose the 1972 discoveries, and to check the nature of the tramway.

The location chosen for Trench 1 was the closest point to the weighbridge that had not been affected by slumping of surface material into the adjacent weighbridge pit. Initially a narrow trench was cut across the supposed course of the tramway. This established the width of

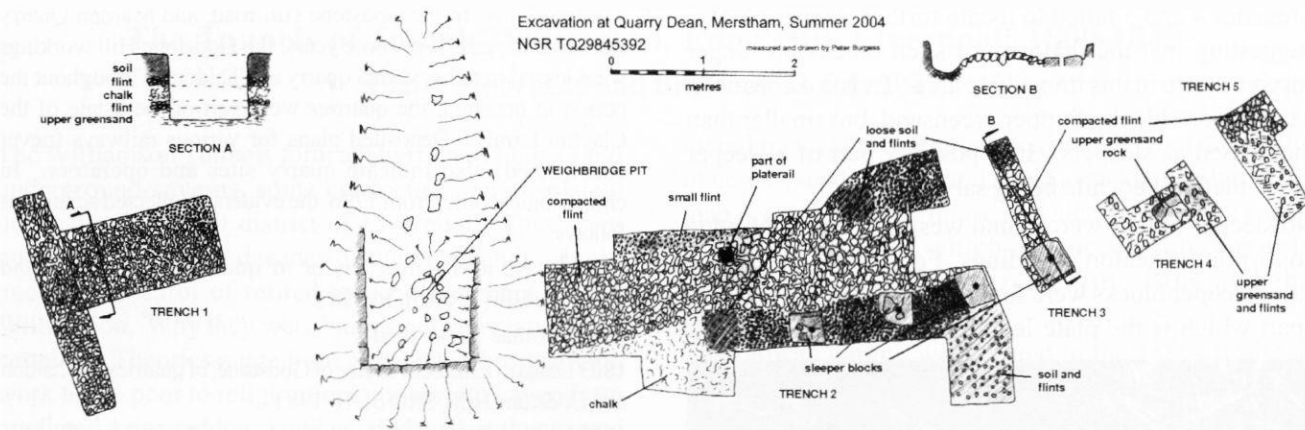


Figure 8. Detail of 2004 investigation.

the trackbed. A wider extension of this trench towards the weighbridge pit was then cut in search of any evidence of sleepers. The trench was deepened below the top flint layer initially discovered to determine the depth and nature of the trackbed.

Trench 2 was planned using Shenton's excavation sketches that had been traced by Osborne. It was expected that two rows of stone sleeper blocks would quickly be exposed. It soon became clear that what actually survives at Quarry Dean is not the same as Osborne's tracings show. A rethink of the project resulted in a search to determine and record what does exist, and produce a fresh interpretation.

Results

The results of the project are shown in a plan drawing (Fig. 8), to which reference should be made while reading the following.

Trench 1 revealed a wide compacted flint trackbed, with no evidence of stone sleeper blocks or of pits where sleeper blocks might once have existed. There were no quarry or tramway-related finds from the trench. The flint trackbed was approximately 8 cm thick and was laid on a bed of compacted chalk. The chalk layer was approximately 17 cm thick, and was laid on a further lower bed of flints of approximately 8 cm thickness. Beneath the lower flint layer was compacted upper greensand. In the northeastern corner of the trench was an area of smaller flints, possibly an area to one side of the original track.

Trench 2 revealed three upper greensand stone sleeper blocks *in situ* along the southern edge of the excavation. No corresponding sleepers were found on the northern edge, contrary to what had been expected from Osborne's tracings. An intact flint trackbed was revealed. To the north and south of the trackbed, a fine flint gravel was found. In three places this compacted gravel was missing, and instead a loose mixture of flints and soil indicated where sleeper blocks may have been salvaged, either for use in a tramway elsewhere or as building stone.

There was one significant find in trench 2, namely a broken fragment of cast-iron plate rail, lying directly on the flint trackbed. The dimensions of this fragment are consistent with it being part of a 48 inch plate rail as measured by Osborne and documented in his paper. The design features of this fragment are not the same as those seen in CM&GIR plates.

A further three trenches were dug to locate further sleeper blocks, to confirm the longitudinal spacing of the sleeper



The four exposed greensand sleeper blocks at Quarry Dean. View east from weighbridge pit.

blocks (and hence the length of rail used), and to find a block on the course of the northern line of rails, this to confirm the gauge of the track.

Trench 3 located the next (4th) sleeper block, the flint track bed to the north of the block, but no corresponding sleeper block on the northern side. Instead there was evidence of a pit where a block might once have sat.

Trenches 4 and 5 failed to locate further sleeper blocks, suggesting that the majority of such blocks no longer survive *in situ* in this immediate area. Trench 4 contained a large loose block of upper greensand, but smaller than those used as sleepers. It is possibly part of a sleeper block that broke while being salvaged.

No sleeper blocks were found west of the weighbridge confirming Shenton's findings. Four upper greensand stone sleeper blocks were found *in situ*, spaced 36 inches apart which is the plate length used on the CM&GIR,



Sleeper block and flint track in Trench 3

and not the 48 inches found on the earlier tramway by Shenton. Two of the spots where sleepers are suspected to have been removed are in locations consistent with a track gauge of 4 feet 2 inches, flange to flange.

Conclusions

The tramway that ran to the weighbridge is highly likely to have been directly associated with the CM&GIR, having a plate length and track gauge consistent with that railway. A significant number of the sleeper blocks have been removed. The tramway did not continue beyond the weighbridge. There is insufficient evidence to determine the purpose or route of any tramway with a plate length of 48 inches at Quarry Dean. However, the plate rail fragment discovered is evidence that a plateway other than the CM&GIR was once laid in the vicinity of Quarry Dean.

Appendix

Notes on Godstone Quarry Operators

Surviving quarry leases in the Surrey Records Office give us some information on the operators of the Godstone quarries, but are often short of details on the precise locations and extent of the workings. Two distinct sites may be identified in the leases,

workings close to the Godstone Hill road, and Marden Quarry further to the east. For some years, the Godstone Hill workings were leased together with a quarry at Chaldon. Throughout the period in question, the quarries were part of the estate of the Clayton family. Deposited plans for various railways (never constructed) also indicate quarry sites and operators. In chronological order from 1796, the evidence collected so far is as follows:

1796 Lease to Thomas Taylor of quarries at Chaldon and Godstone Hill (SRO 61/16/198)

1800 Thomas Taylor died

1803 Lease to Elizabeth Taylor of Godstone, of quarries at Chaldon and Godstone Hill (SRO 61/16/198)

1817 Lease to William Stedall of Godstone, of quarries at Chaldon and Godstone Hill (SRO 61/16/199)

1838 Lease to Henry Stedall of Croydon, and William Stedall of Godstone, of quarries at Chaldon and Godstone Hill (SRO 61/16/193)

1849 Lease to George Baldwyn of Godstone, of Marden New Stone Quarry (SRO 61/16/201)

1854 Underlease from George Baldwyn to Henry Brinsley Sheridan of Brompton, Middlesex, of Marden New Stone Quarry (SRO 61/16/203)

1855 Deposited plan of railway from Caterham to Godstone Stone Quarry (Marden) indicates Marden Quarry in occupation by The Godstone Stone Company (SRO QS 6/8/483)

1855 Transfer of Stedall's lease to William Stenning (SRO 61/16/194)

1869 Lease to Archibald Frederick Paull of London, of Godstone Hill and Marden Quarries (SRO 61/16/196)

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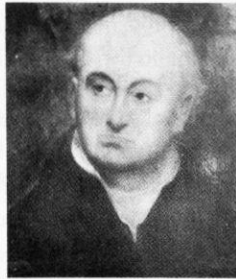
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All plans redrawn by Tim Robinson

The Tunnels of Joseph Williamson, Edge Hill, Liverpool: 1800-1840

Claire Moorhead and Bill Douglas July 2009

The Williamson Tunnels form a labyrinth of tunnels and underground caverns, some connected, some isolated, under the Edge Hill district of Liverpool. They were built in the first few decades of the nineteenth century under the control of retired tobacco merchant Joseph Williamson. Why they were built is not known with any certainty. Theories range from pure philanthropy giving work to the poor to religious extremism in a haven from predicted Armageddon. Until we find well-authenticated documents, we have to be satisfied with these explanations.



In true Liverpool fashion, where we have two major football teams, and two cathedrals, we also have two groups working to save the heritage of Joseph Williamson: The Friends of Williamson's Tunnels (FoWT), and the Joseph Williamson Society (JWS). These two groups have recently made a collaboration agreement, which should facilitate discussions with funding bodies and with Liverpool City Council, who own some of the land around the tunnels.

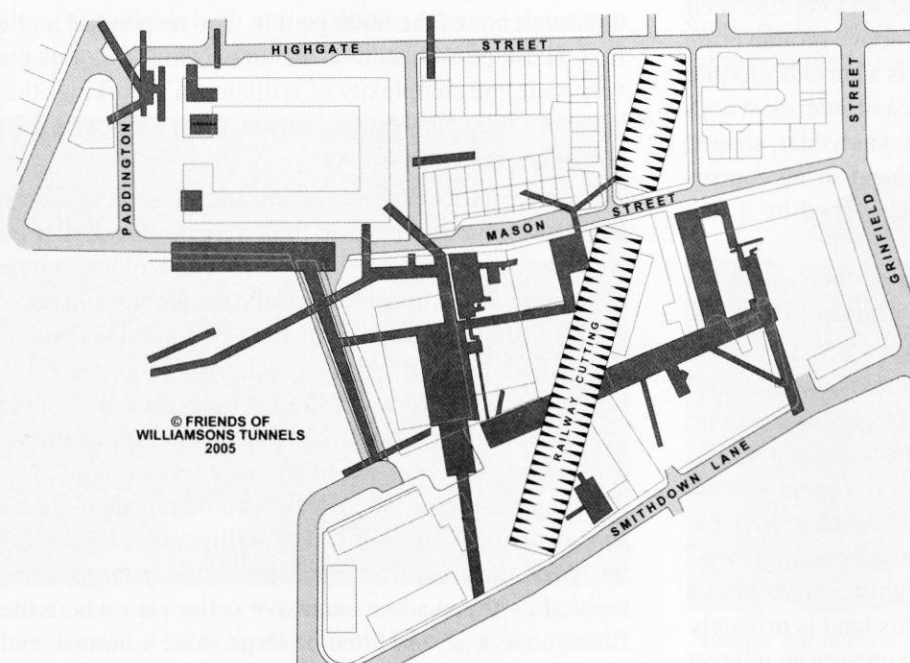
The plan is an estimate of the extent of Williamson's tunnels, based upon existing tunnels and their extensions,

including locations of suspected tunnels from the results of geophysical surveys and some local knowledge. This map is centred on the house in which Williamson ended his days, beneath which are accessible caverns nicknamed Sandstone Arch, Wine-Bins and the Banqueting Hall.

The railway cutting was created in the 1880s from the tunnel built by Stephenson in the 1830s when the Liverpool & Manchester Railway was extended from Edge Hill to Lime Street station to serve Liverpool city centre. That tunnel ran under part of the land leased by Joseph Williamson. The (unfortunately lost) Minutes of the Tunnels sub-committee of the L&MR could have given much more information about the local legend that Williamson was tunnelling beneath Stephenson's railway. The Friends of Williamson's Tunnels are negotiating a lease on a little plot of land near the top left-hand corner of this map on the street called Paddington. This will give space to carry out the clearance of the deep structures that form the cellars of a building begun by Joseph Williamson in the 1830s. For nearly 100 years that building was occupied by Lunt's Bakery, who took advantage of their extensive basement to dispose of the ash from their ovens. The hope is that new passages will be found as the true extent of this system is revealed. Sections of the tunnels have been cleared, partly renovated, and opened to the public by the JWS at the Williamson Tunnels Heritage Centre on Smithdown Lane. There the bulk of the work has been done by hand with pick, shovel and barrow. This human-scale work has ensured that alterations in loading on buried brick and stone structures have been slow and steady. This has

permitted careful assessment at each stage, creating good expertise amongst the digging teams. Volunteers have sifted the debris, and at the Heritage Centre there is an impressive catalogue of their finds including analysis of the numerous ceramic items, useful as date-markers in the oldest layers of infill.

Near the Heritage Centre there are three main areas that have been the subject of a number of geophysical surveys, presenting problems which have stretched surveying techniques to the limit. The tunnels take several forms: most are brick arches spanning deep rock-cut chasms in cut-

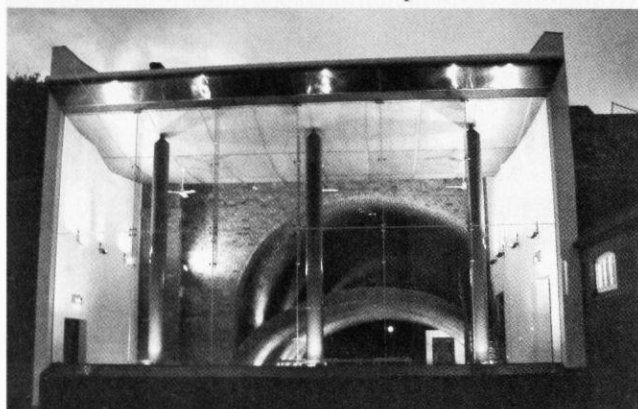


Redrawn by Tim Robinson

and-cover work; occasionally there are stone arches, and rock-cut tunnels too.

Williamson's work is also being made accessible through the work of the Friends of Williamson's Tunnels, a voluntary organization dedicated to tracing and renovating the whole of the system. FoWT is in protracted negotiations with the owners of the neighbouring Liberty Park Student Village and with Liverpool City Council for purchase of a lease at the 'Paddington' site – the first of the three areas mentioned above. Here, plans have been submitted to clear underground chambers and make their access safe in accordance with the ever-increasing demands of Health & Safety legislation, and work will be carried out in accordance with detailed method statements drawn up early in 2009.

Between the Heritage Centre and Paddington is the second section of the tunnels, commonly known as the 'House site' – the one in which Joseph Williamson ended



The 'Double tunnel' at the rear of the Lord Mayor's Stables Yard - Photo copyright Joseph Williamson Society. Compare with the picture of the double tunnel in 1998 before restoration on the rear cover of this magazine.

his days, and next door but one to the large house into which Mr and Mrs. Williamson moved not long after their marriage in 1802. All that is left of it above ground is the front façade, the inner face of which is a curious mixture of brick and stone and bears evidence of interior wood-panelling. The exterior of the house was ashlar, shaped and dressed stone blocks, with thin-band string courses dividing each floor. The house was topped by a low parapet which hid the roof – a London technique copied to comply with fire regulations. Behind this façade is a vacant plot of land, beneath which can be found the striking underground 'Banqueting Hall'.

Between the 'House site' and Smithdown Lane is a third area, where test bores detected a large underground chamber in excess of twelve metres wide. Partial exploration revealed only the top couple of metres in depth and about ten metres in length of this chamber, the remainder blocked by massive infill and a collapsed roof arch. The latter reveals that the arch was five bricks thick, so Williamson built to last. This land is privately owned, and the owner periodically expresses an interest



The 'Banqueting Hall' in 1999, located beneath Williamson's House - Photo by Nick Catford

in building there. Tunnels beneath land directly alongside the Heritage Centre are also similarly threatened by an extant planning application for the building of flats on the site of the old Lord Mayor's Stables: the next developer to purchase the site will very likely demolish these 1860s purpose-built stud stables for Liverpool Corporation's fleet of heavy draught horses, and thereby preclude access to yet more of Williamson's tunnels.

We have often been asked by visitors about getting parts of the site listed with English Heritage. However, this a legal activity which draws a neat boundary around the property – nigh on impossible on rambling passages and caverns beneath the lands of numerous owners on the surface. Portals to tunnels could be listed, and we did try some time back to do just this, only to be told that the site had only "local interest". This probably saved the FoWT a great deal of expense, but took no account of their nationwide membership at the time of nearly one thousand, nor of the 6000 people who responded to the first 'Heritage Weekend' at the tunnels in 1998. It is the very scale and complexity of Williamson's workings that enhances their interest and makes them a most special part of Liverpool's history.

The desire is to explore, clear, and present to future generations the structures as they were the day they were constructed. Many tunnels are filled with building rubble as subsequent occupants of the land sought to build anew on this difficult ground in the time-honoured fashion of back-fill, flatten and forget, occasionally followed by the time-honoured surprise as strange holes appeared in the ground or buildings began shifting on their foundations. This year, a twentieth-century inter-war cottage-style dwelling on Mason Street has been demolished due to subsidence. It was built where Williamson erected, for his friend the artist Cornelius Henderson, a large house reputed to have had an extensive cellar area where the floor above was supported on large stone columns, and no kitchen!

The Edge Hill district of Liverpool presents a dip-and-scarp form, with the steeper scarp edge facing towards the city. It is underlain by sloping beds of Triassic sandstones. Wherever outcrops occurred, the stone was quarried from earliest times. It would seem that much of the stone produced from Williamson's earlier diggings was used for houses he built and to reline the tunnels underground. Rough-hewn stone was used for massive boundary and supporting walls like those that can be seen at the side of an industrial warehouse on Mason Street. The early writings of local historians James Stonehouse (c.1845) and Charles Hand (c.1920), on which so much assumed knowledge of Williamson is based, state that Williamson never sold any of his sandstone but gave much of it away. One such gift was made to St Jude's Church, a few hundred yards downhill from Mason Street. With his wealth, he certainly had no need to profit from selling stone. A study of property records shows that beneath his own house he had no mineral rights and therefore was unable to sell stone he extracted without paying the freeholder, the West Derby Wastelands Commission, from whom he held the property.

After completing alterations to that first large house, Williamson quickly took up other leases along Mason Street, and enlarged his workforce with bricklayers, joiners and masons. There was a fashion to have large gardens and orchards behind the houses. The lie of the land between Mason Street and Smithdown Lane resulted in these gardens initially being at some 20 feet or so lower than the houses and backed by a cliff face. Williamson had his men build brick arches in front of the cliff upon which the terrace gardens were brought up level with the houses, thereby giving splendid views across Liverpool Bay and to the Clwyd hills. Those arches became the first parts of the tunnels. He then began digging back into the cliff face behind the arches, linking his properties along the hillside with intriguing passages and stairways. He did not stop his excavations until the day he died.



The 'Corner tunnel' in 1998 before restoration. The entrance is located at the back of the Lord Mayor's Stables Yard
Photo by Nick Catford

Who was Joseph Williamson?

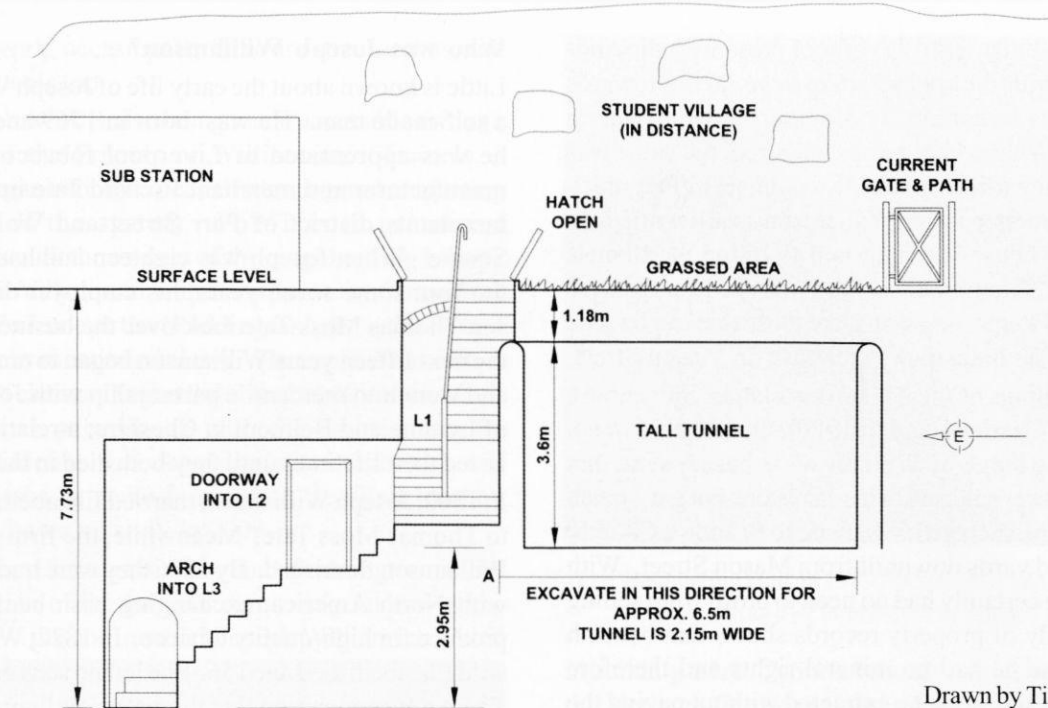
Little is known about the early life of Joseph Williamson, a self-made man. He was born in 1769 and as a child he was apprenticed to Liverpool tobacco and snuff manufacturer and merchant Richard Tate in the central merchants district of Parr Street and Wolstenholme Square. When Joseph was eighteen and had been with the firm some seven years, his employer died and the son Thomas Moss Tate took over the business. During the next fifteen years Williamson began to amass capital, and went into mercantile partnership with Joseph Leigh of Lymme and Belmont in Cheshire: a relationship that lasted their lifetimes until they both died in the year 1840. In 1802, Joseph Williamson married Elizabeth Tate, sister to Thomas Moss Tate. Meanwhile, the firm of Leigh & Williamson flourished. By 1806 they were trading directly with North America, exchanging Irish beef and dairy produce for high-quality tobacco. In 1822, Williamson's wife Elizabeth died aged 56. She left no sons or daughters. There is a supposition that thereafter Williamson sought solace by turning his attentions ever more assiduously to the labyrinth.

Williamson was reputed to often have his men perform apparently pointless duties. It is said that he would get a man to move a pile of rocks from one place to another and then back again. There is evidence of tunnels being built and immediately bricked up again, alongside fine arches that led nowhere. By 1820, the man that locals then called the 'King of Edge Hill' was in control of his own subterranean kingdom. Many of Williamson's workmen became skilled as they served their apprenticeships on his tunnels, and probably they were recruited by the rail engineers to augment those gangs already in their employ.

By 1830, Stephenson had constructed the Wapping railway tunnel and then he began the Edge Hill to Lime Street tunnel extension to the Liverpool & Manchester railway, directly beneath Williamson's garden. There is



Joseph Williamson's house in Mason Street in 1998. Today only the facade survives - Photo by Nick Catford



Cross-section through the Paddington Tunnels – first phase of proposed clearance works 2009.

little doubt that Williamson would have witnessed the inaugural locomotive journeys at Crown Street and the Chatsworth Cutting. Perhaps he was one of the many private shareholders in that highly speculative and controversial project.

Williamson died, aged 70, on 1 May 1840. He was buried alongside his wife and her family in the Tate family vault in the cemetery of St Thomas's Church, Park Lane, where they had married 38 years earlier. Today, the grave site is skirted by the large 'Liverpool One' new retail development. Grosvenor, the latter's developer, has approved the design of an innovative garden to mark the site of St Thomas's churchyard, which will be known as the Williamson Memorial Garden.

His true memorial is the mysterious labyrinth at Edge Hill, so much of which is still under threat and which awaits rescue and conservation.

Joseph Williamson is reputed to have begun construction of the four-storey building at the junction of Paddington and Highgate Street about 1836: a 1920s report by a local historian tells us it had at least four to six levels of cellars beneath it, and from thence there were passages to other Williamson buildings. The Friends of Williamson's Tunnels first gained entry to the system via the roof of a passage at the second level down from the surface (i.e. at L2, some 12 ft down) in 1999. Since then, the protracted negotiations for the leasing of the land around the entrance have come to resemble the labyrinth of Williamson's own work!

The doorway to L2 in the centre of the drawing leads to the cross-passage which gives access to the four caverns on that level which are arranged in an H-shape. Below this in L3 is a similar H-shape of four caverns, but they have different lengths to those above.



Gothic arch in the backfilled third level below Paddington
Photo by Chris Iles

The proposal for clearance work at the Paddington site is to take place in several stages, and this cross-section shows the first phase involving the excavation of the "tall tunnel". This may have contained yet another staircase as it appears to have a floor at the second level down (L2) from ground level yet reaches up through Level 1 and perhaps beyond to the original ground level.

The arch to Level 3 (L3) is at the foot of the (known) stone steps, which spiral round the corner, and stop dead there. Williamson might have had a wooden structure beyond, though shallow digging has not revealed any holes in the walls to support the top of such a structure: yet another Williamson mystery that requires investigation! In Level 3 part of the southeast tunnel is at least 40ft deep, the top 20ft of the ash infill having been dug and shored up by the Friends several years ago. The Mines Inspectorate have visited and given advice for future action.

The Friends of Williamson's Tunnels welcomes expert advice, so if you have any comments, please visit the website www.williamsonstunnels.com.

Keys to the Kingdom

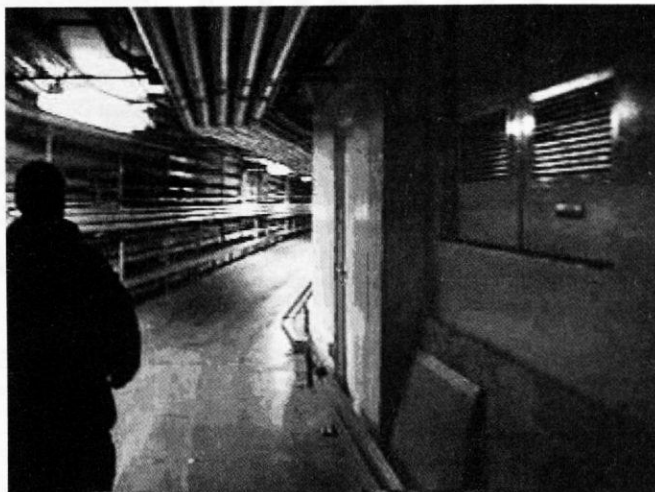
John and Jennie Lill

Whilst the idea of spending time in the company of Mickey Mouse when in Florida may not appeal to everyone, seeing behind the scenes and below ground might spark some interest. On our Christmas trip to Florida we booked ourselves on the “Keys to the Kingdom” tour. This 4.5-hour tour of the Magic Kingdom provides an opportunity to learn some background on Walt Disney and the Parks as well as being able to go “backstage”. Disney believes that what they provide more than anything is a show, therefore there is the concept of “on and off-stage”. This extends through everything, even when asking the guide questions; depending on where you are will influence the answer you receive.

The main attraction of the tour for most people is the underground tunnels. Whilst technically not underground, these “Utilidors” (a Disney word composed from *utility* and *corridor*) run for around 1.5 miles over nine acres and provide approx 392,000 square feet of space under the 107-acre site of the Magic Kingdom. Florida is essentially a swamp so there is no possibility of digging down as you soon hit the water table.

When Walt Disney looked at building a second park, he wanted the actors and characters to have a way of moving around the site without being seen. The idea of the utilidors was born and so first the 15ft-high complex was built at ground level and then covered with over seven million cubic yards of earth. There was an existing lake on the property that was drained and dug out to create the Seven Seas lagoon at the front of the park and the spoil was used as covering for the tunnels. The main park of Castle and Lands was then built on top meaning that the park is essentially on the first and second floor levels.

There is an entrance to the utilidors at the back of the park which gives access to the buses that bring staff to work. This means that not only do staff members not park anywhere near the guests, they also do not enter

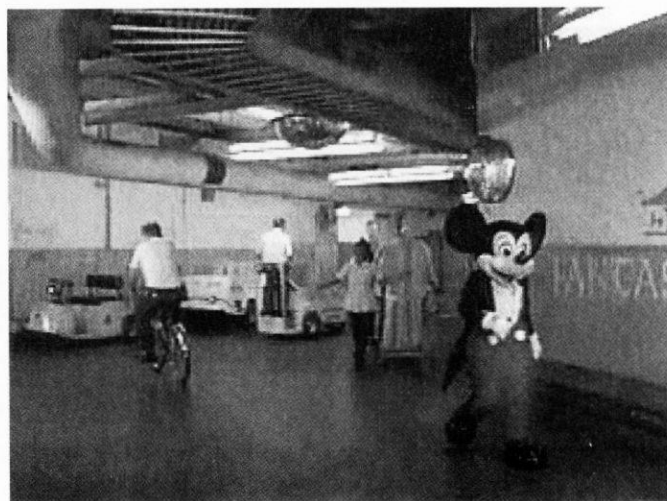


the park through the same entrance. Within the utilidors there are offices, locker rooms, break rooms, restrooms and two employee cafeterias as well as wardrobe and costuming. There are maps of the area below and above ground to help employees move around as well as colour-coding routes to stop people getting disorientated and lost. Only electric vehicles are allowed (for obvious reasons) with just two exceptions: emergency vehicles and the armoured cars that collect the day’s cash takings.

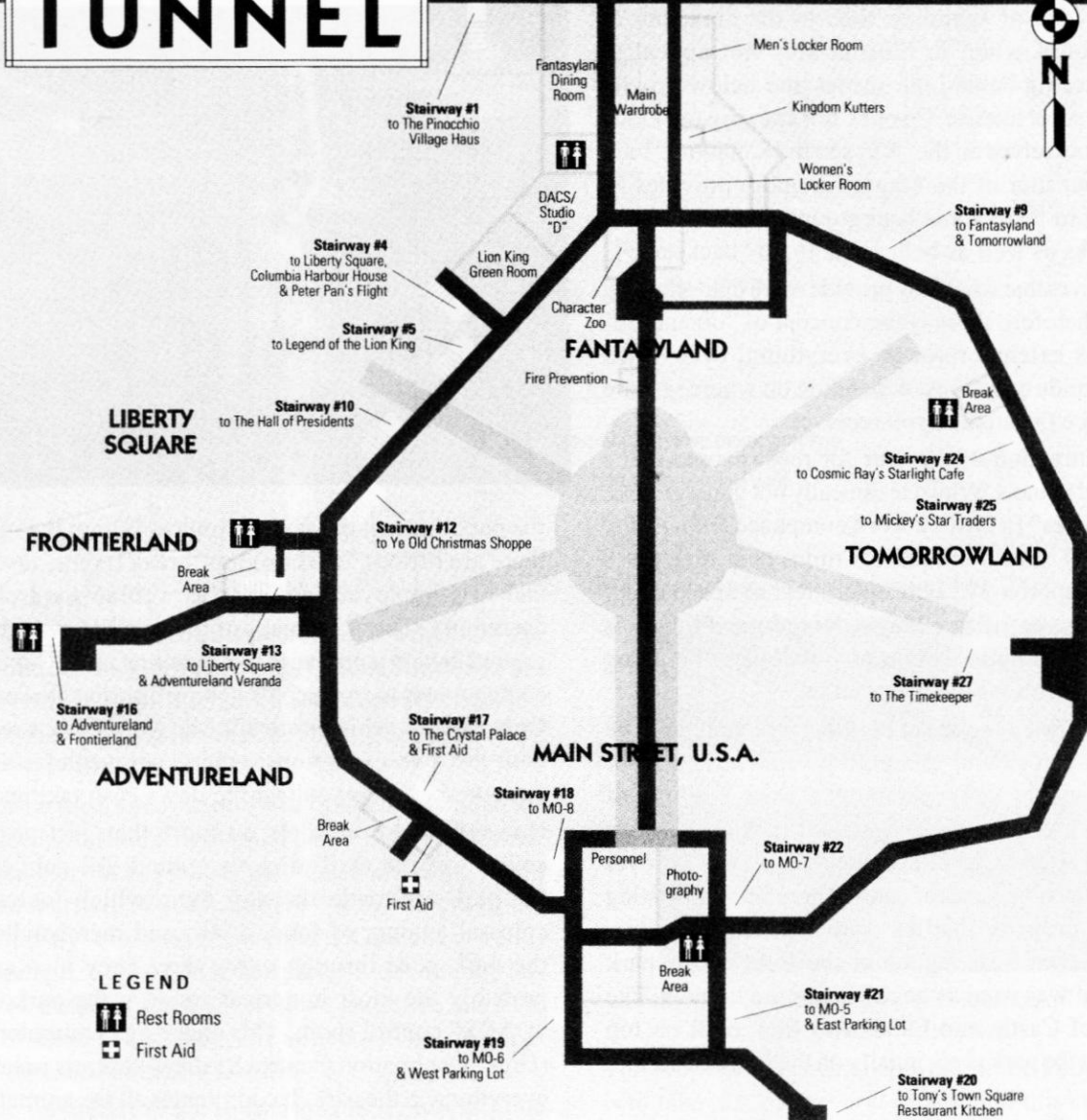
However, these utilidors do more than just provide a covert way for staff to move around. All deliveries to the park are made through them which include the colossal amount of food, drinks and merchandise that the park goes through every day. They also contain probably the most important room in the park — the “DACs” control room. This space-age computer room (Digital Animation Control System) controls practically everything in the park. It coordinates all the animatronics figures ensuring they are all on cue. It even opens stage doors, curtains and controls the park lighting. This system also checks fire protection, equipment failure and monitors for power losses anywhere in the park. The system is so sophisticated that just controlling the park’s animatronics means it monitors more than 72,000 functions every second!

Another advantage of the utilidors is that the utility services that would normally run underground run along the ceiling. It would be incredibly disruptive to dig up Main Street to get to a power line; instead all the engineer has to do is climb a few steps up a ladder. Water and sewage are also routed through here which means any problem pipes will be spotted and fixed almost immediately.

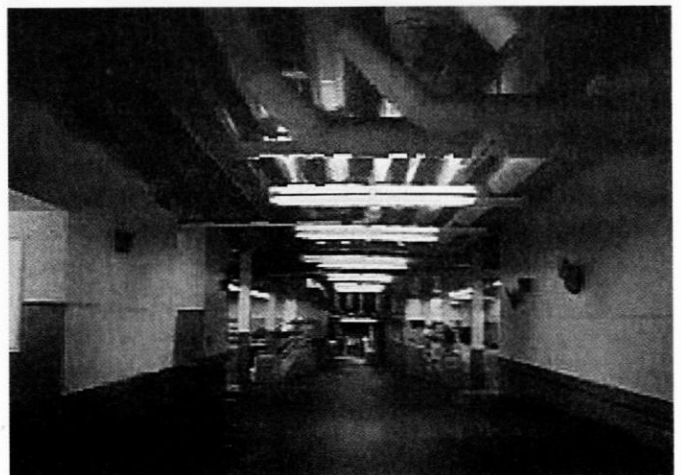
One of the most forward-thinking parts of the system is the waste disposal and recycling. All rubbish is collected and taken to one of the many access points in the park of the AVAC (Automated Vacuum Collection) system.



MAGIC KINGDOM. TUNNEL



This wizard moves rubbish at around sixty miles an hour through pneumatic tubes to a central collection point. Here it is sorted by hand so any valuables can be retrieved and recyclables removed. The facilities for recycling have been in the park since it opened in 1971 showing how forward-thinking Walt Disney really was. The rubbish is then burnt producing around 25 to 30 percent of the power requirements for the park. Although only a small part of the tour, the utilidors provided an unusual insight into the world of Disney. The visit and the park are summed up in the Disney values, Safety, Courtesy, Show and Efficiency!



The Nursemaids' Tunnel, Park Crescent Gardens and Park Square Gardens and Two Pioneering Railway Tunnels, London

Paul W. Sowan

The 'Nursemaids' Tunnel' links Park Crescent Gardens, on the south side of Marylebone Road, with Park Square Gardens on the north. It obviates, for persons having access to the gardens, the need to cross the busy major road. The tunnel passes directly above the Metropolitan Railway between its Baker Street and Great Portland Street stations. The gardens are open to the public only very infrequently, notably during the annual London Squares Day. Otherwise there is access only for keyholders, these being presumably local residents. The gardens are the property of the Crown Estate.



Nursemaids' Tunnel; the Metropolitan Line railway arch can be seen in the centre – Photo by Drew Bennelick

The history of this small London tunnel is inextricably bound up with that of Marylebone Road, Park Crescent and Park Gardens, the Metropolitan Railway (1862), and London Underground's Bakerloo Line (1906). Thus we find, at this location, a very early pedestrian subway associated with the world's first underground railway, and the world's first electrically operated deep tube railway.

Marylebone Road

Marylebone Road, and its extensions including Euston Road, were laid out in 1756 – 57 under the terms of an Act of Parliament. Until 1857 it was known as New Road. Its original purpose was a new route for driving cattle from west of London to Smithfield Market, bypassing Oxford Street and Holborn. It now, amongst other things, connects four of London's railway termini – Paddington, Euston, St Pancras and King's Cross.

Park Crescent and Gardens, and Park Square Gardens

Park Crescent was designed, as were neighbouring terraces of houses, by the architect John Nash [1752 – 1835] as part of his larger scheme extending from

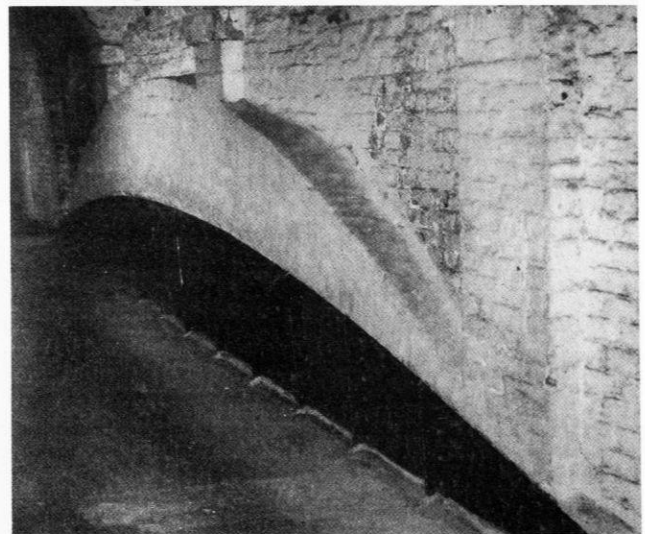
Regent's Park southwards by way of Regent Street as far as Carlton House.

The Crescent had been intended to form the southern half of a complete circle, as in the Circus at Bath, but was never completed as such. Construction started in 1812, but came to a halt after only six houses had been built, on the builder being declared bankrupt. Building was resumed in 1818, but what was to have been the northern half of the intended circle became in fact two terraces built in 1823 – 25 facing each other across Park Square.

Exactly when the gardens were laid out and their tunnel link established is unclear, but assumed to pre-date the Metropolitan Railway built in 1860 – 62.

The Metropolitan Railway

Construction of the Metropolitan Railway, opened from Paddington to Farringdon in 1862, commenced in 1860. This, the world's first 'underground' railway, was made by the 'cut-and-cover' technique, mostly below public roads. A trench was excavated (doubtless at some inconvenience to road traffic) and the double-track railway formed below a depressed curved arch in yellow brick, as can be seen at Baker Street (platforms 5 and 6) or Great Portland Street stations. Soil was then replaced above the archway, and the road surface reinstated. The new railway, linking the main line stations at Paddington (1838), Euston (1837), King's Cross (1851) and Farringdon (1863) was worked at first by steam locomotives, so the atmosphere in the tunnels and stations can be imagined!



Internal view showing arch above Metropolitan Line railway tunnel in June 2006 – Photo by Adam Sowan

The Bakerloo Line and Regent's Park Station

The Bakerloo line opened from Baker Street to Kennington, with a station at Regent's Park, in 1906. It

was the first of London's new electrically operated deep tube railways, introduced by the controversial American financier Charles Tyson Yerkes [1837 – 1905]. The railway company's 'gutter title' was derided as an example of American vulgarity by Londoners at the time. This line, in deep tunnel, runs below Portland Place and Park Crescent Gardens to Regent's Park Station before turning west to Baker Street Station. The station lies on the south side of Marylebone Road, encroaching slightly on and below Crescent Gardens. A notice in the station states there to be 96 steps in the emergency stairs to and from the platforms, implying a depth below street level somewhat greater than 17 metres (56 feet).

Layout at surface

Marylebone Road is exceptionally wide, perhaps as to be expected in view of its original purpose – driving cattle to market. Presumably, then, it was as wide as this when the gardens were laid out, at some time between 1812 and 1825, as the corners of the two public gardens are marked by four small single-storey pavilions in the same classical style as the Nursemaids' tunnel portals. The pathways in the gardens sloping down to the pedestrian subway can be seen from the public highway a little west of the eastern pavilions, and east of Regent's Park Station.

Regent's Park Station itself has an entrance only on the south side of the main road, and is accommodated by an encroachment into the area of Park Crescent Gardens. Two squat polygonal-plan towers, part of the station within the gardens, may perhaps be the heads of lift or emergency stairway shafts.



North Portal – Photo by Drew Bennelick

Engineering

This small brick-lined under-road tunnel presents one or two points of interest. At each end there are three shallow concave bays in the side walls, whereas the central section has parallel straight walls. Within the central straight-walled part of the structure it can be seen that the tunnel floor is let down into the crown of an iron arch spanning the Metropolitan & District Railway, which

runs directly below. It thus seems that at this point the railway has an iron rather than the usual brick arch.

There is a padlocked iron door in the first east-side bay, just inside the south portal, the purpose of which is unknown. Presumably there is some provision for drainage, either gravitational to the railway tunnel (an option not available before the railway was made) or by means of a sump and pump.

The tunnel is whitewashed and electrically lit. There is an iron bracket on one wall: presumably this held an earlier lamp.

As the nursemaids' tunnel was presumably created, along with the Crescent and Square, anything up to 48 years before the railway, the railway contractors evidently had to tunnel below the pre-existing structure or, alternatively, sever it completely while the railway was constructed.

The concave bays at each end of the older tunnel were perhaps so constructed to resist lateral earth pressure, the surrounding ground presumably being relatively un-



Iron door in east wall in June 2006 – Photo by Adam Sowan

cohesive made ground or gravel or the like. If that was their function, such bays would be expected all the way through. It seems likely, therefore, that during construction of the railway tunnel, the higher-level tunnel was opened-out, an iron lining inserted in the lower tunnel, and the possible central bays rebuilt as straight walls, perhaps with counterfort brickwork behind them as an alternative earth-pressure defence, or perhaps just so much thicker for the same reason.

Source

WEINREB, Ben, and Christopher HIBBERT (eds), 1983, *The London encyclopaedia*. Macmillan [ISBN 0-333-57688-8]

London's 19th-century "Nursemaids' Tunnel"

Stewart Wild

Over the weekend of 13-14 June 2009, nearly 200 of London's private gardens and squares were open to visitors under the Open Squares scheme, and I took advantage of the occasion to explore the southern fringe of Regent's Park. My interest in the Nursemaids' Tunnel was sparked by a conversation with Paul Sowan, whose article about its construction appears elsewhere in this issue.

At the top of Portland Place, south of Marylebone Road, is Park Crescent, a beautiful semicircle of Georgian architecture designed by renowned architect John Nash in 1811. The Crescent encloses about 1.5 acres of private gardens, originally intended to be mirrored by an opposing semicircle on the north side of Marylebone Road. After a few problems with finance, the buildings and gardens were complete by 1819.

The northern part was eventually doubled in size and became Park Square, with elegant terraced housing to the east and west, Regent's Park to the north and Marylebone Road along the south side. The square and the gardens were laid out in 1823-5.

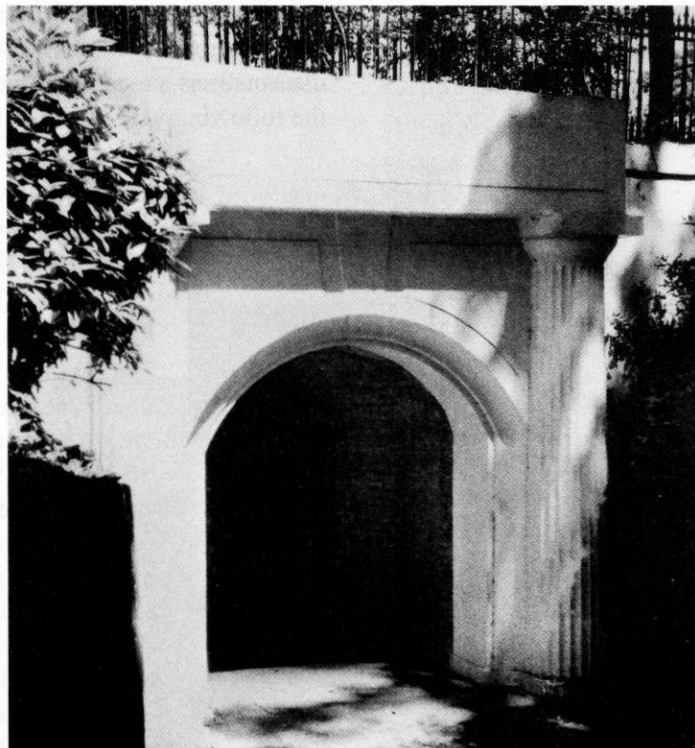
The gardens in both Crescent and Square contain many spectacular and rare shrubs and trees, including enormous plane trees that were apparently planted by the Duke of Wellington in the years following 1815 to commemorate his victory over Napoleon at the Battle of Waterloo. Nowadays these huge trees are amongst the tallest in London.

The only means of access between the two gardens was, and still is, the elegant pedestrian tunnel under Marylebone Road. Used by generations of Victorian nannies pushing perambulators, it acquired the nickname "Nursemaids' Tunnel".

The tunnel is about ten feet wide and nine feet high, paved with flagstones and lit nowadays, unfortunately, by relatively modern neon tubes. It is solidly made of brick, with seven vaulted 'bays' and, in the middle, curved steel plating at the bottom of each side showing where the tunnel crosses the roof of the Circle and Metropolitan Line tracks that run east-west underneath. The brickwork was at one time whitewashed, but the wash is now peeling.

The portals at each end have a Classical appearance, and are reached by a double-curving tarmac ramp. Most of the ramps' supporting walls on each side still have their original nearly 200-year-old brickwork and, like the pedestrian underpass, remain in remarkably good condition.

A further connection with the Underground is the Bakerloo Line's Regent's Park Station which lies below Park Crescent gardens and whose entrance on Marylebone Road, dating from 1906, is just to the west of the Nursemaids' Tunnel. A couple of fake follies in Park Crescent and an octagonal summer house in Park Square are in fact cleverly-disguised ventilation outlets for the Bakerloo Line tunnels below.



South portal in June 2006 (iron door visible in east side first bay) – Photo by Adam Sowan

Ram Hill Colliery

By David Evans

Historic Environment Record Officer, South Gloucestershire Council

The Ram Hill Colliery dates from the nineteenth century and was successfully producing good-quality coal between the early 1830s and the late 1860s.

Most of the coal from this mine was sent to and used in Bristol, for domestic heating and fuelling the increasing number of steam engines during the Industrial Revolution.

Three factors that make this Ram Hill Colliery site particularly special are:

Standing Archaeology

While there are no complete buildings on this site, there are the remains of the engine house, the complete footprint of the horse gin, the loading bays of the Dramway and possibly, but yet undiscovered, the boiler house and the water reservoir.

The Dramway

The old horse-drawn railway, that transported the coal from the Coalpit Heath mines to boats waiting at the quay on the River Avon, has its northern terminus at the Ram Hill Colliery.

Public Ownership

The site is owned by South Gloucestershire Council, affording archaeology and countryside management expertise and assured public access.

Because the Ram Hill site is of such importance, English Heritage have scheduled it, making it subject to special protection.



Dramway

The Friends of Ram Hill Colliery have been formed to restore the site. Their aim is to raise funding to protect the standing archaeology, to improve access and interpretation and generally open up and maintain the site as an area of interest and local heritage for everyone in the community.

The Project

The Ram Hill colliery in Coalpit Heath was once the hub of 19th-century coal mining in Westerleigh parish. It was the terminus of the Dramway, which was built in 1828 and was probably the last railway in England designed to use horses as a means of locomotion (the Rainhill trials the following year heralded the use of steam).

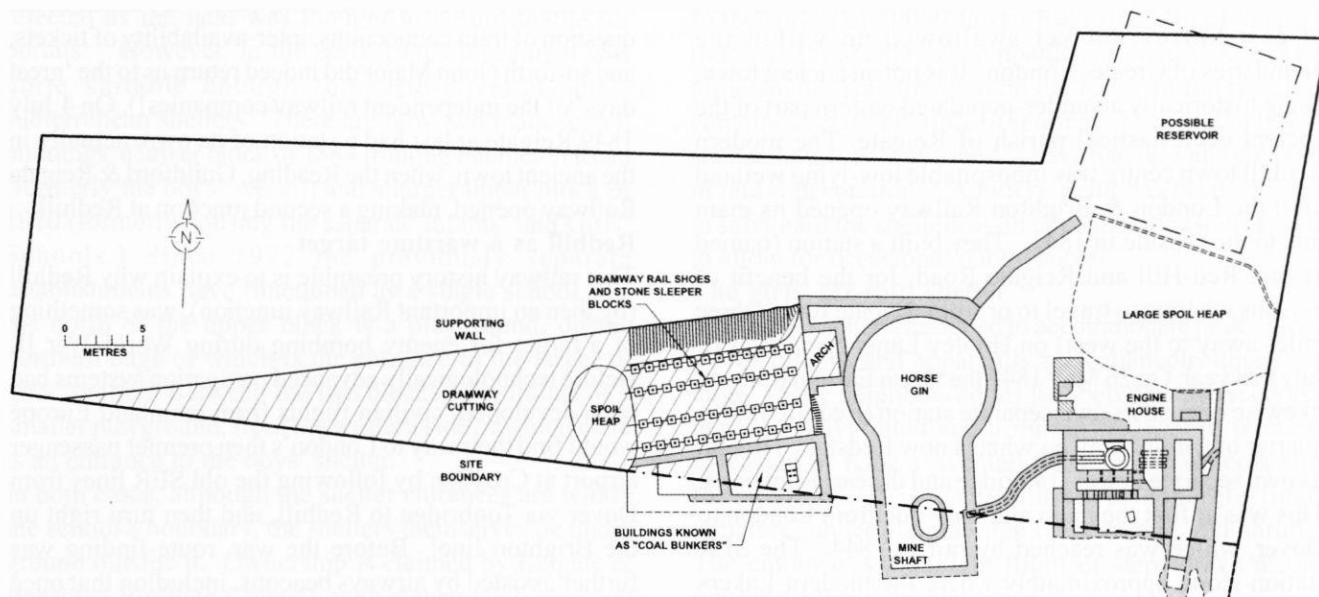
It is a mystery why the Dramway ended here. A number of plans exist showing its proposed route, but none showed it ending up at Ram Hill. This conundrum, and others, are revealed in a new study.

Excavations

The fact that the site survives at all is a fluke. The Great Western Railway bought the area for its new direct route from South Wales to London. In the end the cutting stopped just north of the site. The mine lay forgotten until 1981 when a local archaeologist, John Cornwell, rediscovered it. Then the high unemployment of the 1980s led to a number of job creation schemes, one of which was to carry out comprehensive work at the site. This took place in 1987, but funds ran out and it was never completed.



Horse Gin



Redrawn by Tim Robinson

Then a Bristol University MA student, Bridget Hetzel, embarked on a study here and volunteers came in to help clear the site. The results have been spectacular: it has already been cleared of recent growth and we will be removing two spoil heaps which were formed during earlier excavations. This will expose more of the Dramway, and hopefully the boiler house for the steam engine.

Preserving the site

We are well on the way to securing the longterm management of the site. We hope to maintain a balance between archaeology and ecology by maintaining it as a grassed area.

Work has begun on removing the upper spoil heap. There is a long way to go and we are looking for sites that would like the material. A stone base marked on the limited plans of the site has been partially exposed; it looks like a chimney base - so the elusive boiler house may not be far away.

Geophysical Survey

A geophysical survey at Ram Hill Colliery has revealed clear traces of a reservoir in the northern corner of the site. The method of remote sensing was resistivity, which had not been expected to give good results due to the nature of the ground. It was carried out for the Friends of Ram Hill Colliery by local enthusiasts Sagascan. The results will be used to inform those conserving the site.



St. John's Schools World War II Air Raid Shelters, Redhill, Surrey

Paul W. Sowan

The origins of Redhill as a World War II target

Redhill, now subsumed within the Borough of Reigate and Banstead, is one of the principal towns of that part of east Surrey not yet swallowed up within the boundaries of Greater London. It is not an ancient town, being historically an under-populated eastern part of the ancient ecclesiastical parish of Reigate. The modern Redhill town centre was inhospitable low-lying wetland until the London & Brighton Railway opened its main line to the seaside in 1841. They built a station (named at first Red-Hill and Reigate Road, for the benefit of persons wishing to travel to or from Reigate two or three miles away to the west) on Hooley Lane, opened on 12 July that year. On 26 May 1842 the South Eastern Railway likewise opened its own separate station (Redhill SER) a quarter of a mile away on what is now Redstone Hill, on its own separate line to Tonbridge and the east Kent ports. This was at first the main and only line from London to Dover, which was reached by rail in 1844. The SER station stood approximately where the modern Lakers Hotel is located.

The Brighton and South Eastern Railways, in April or May 1844, abandoned the two separate stations (separated by a quarter of a mile of reputedly muddy lane, and up Redstone Hill and down again) in favour of a joint station just to the north of the Brighton and Dover lines' junction, roughly where the present station stands today. This site was destined to become the focal point

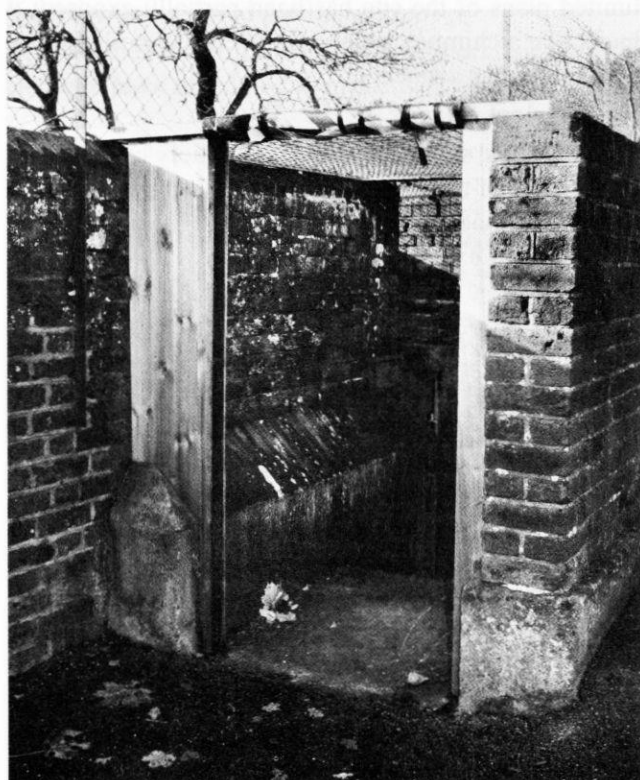
for the new 'railway' town. Not that the two rival companies cooperated with each other very much in the question of train connections, inter-availability of tickets, and so-forth (John Major did indeed return us to the 'great days' of the independent railway companies!). On 4 July 1849 Reigate at last had a station of its own, actually in the ancient town, when the Reading, Guildford & Reigate Railway opened, making a second junction at Redhill.

Redhill as a wartime target

This railway history preamble is to explain why Redhill (by then an important Railway junction), was something of a target for enemy bombing during World War II. Before technologically advanced navigation systems had been developed, civilian flights from mainland Europe would find their way to London's then premier passenger airport at Croydon by following the old SER lines from Dover via Tonbridge to Redhill, and then turn right up the Brighton line! Before the war, route-finding was further assisted by airways beacons, including that once mounted on top of the surveying observatory tower above the mile-and-a-quarter Merstham tunnel. The lights in these beacons were presumably extinguished whilst invasion remained a threat. Redhill Station had its name painted on the roof before the war, to assist Lufthansa and other pilots. Painting this out in the war years hardly disguised such a prominent four-way junction from the pilots of incoming enemy aeroplanes from Germany! Here, the main line from London to the south coast crosses the strategically important cross-country line from the Midlands and the army camps at and around Aldershot to the Channel ports.

Little London

If the original 'heart' of Redhill was a muddy lane between two wayside stations, there was something of a nucleus marked by a church (now St. John's) at an outlying Reigate hamlet called 'Little London', erected in 1843 (later rebuilt and renamed as we see it today.) This is up the hill south-southwest of, and somewhat remote from the modern town centre, something like seven eighths of a mile from the station (the modern Earlswood Station is much closer.). Plans for a school here, in 1840, pre-date the London & Brighton Railway, and were realised in 1846, when it has been established that teaching (and, one hopes, learning!) commenced. Little London is still a quite distinct part of Redhill, boasting a small cluster of old buildings in an infrequently seen local sandstone (nothing like the more usual Reigate stone to be expected hereabouts), and a pub or two, all dwarfed by the huge brick and flint church. It is a hilly and breezy site, on the southern flanks of Redhill Common.

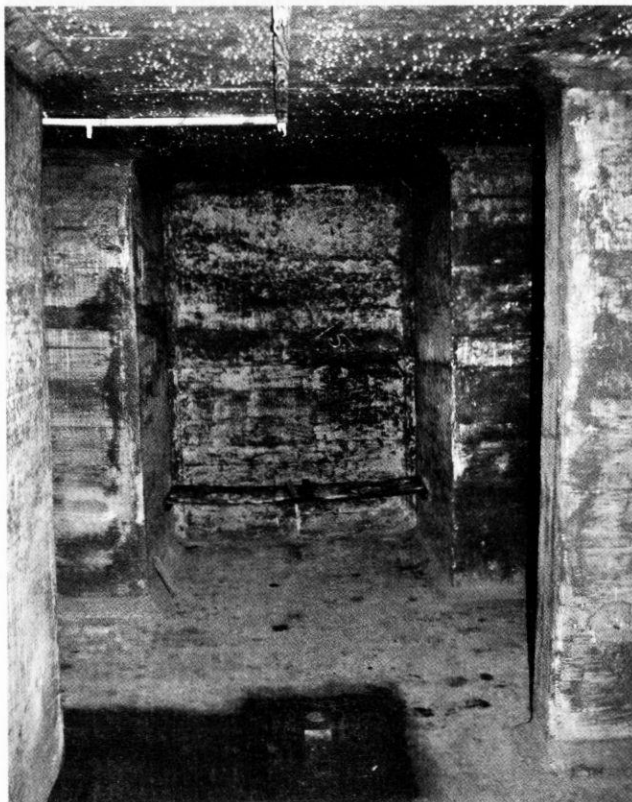


Entrance to the Girls' shelter - Photo by Bob Clary

The schools

The original school buildings, all now replaced by later ones, were erected in 1845 – 46 on the north side of Pendleton Road, facing St. John's Church. This site had previously been considered for the church, but was rejected as the land was thought to be unsuitable for burials! However, in the early 1940s it seems it was quite suitable enough for earth-covered semi-subterranean shelters. There are now two main school buildings: a lower block of 1884 fronting Pendleton Road (formerly the boys' school) and a larger upper block of 1910 (formerly housing the separate Infants' and Girls' Schools.) Since 1972 the previously separate establishments have functioned as a single school. To the north of the upper block is a playground, on the northern edge of which is the entrance to the larger or girls' shelter. Between the two blocks of buildings is a smaller playground, from the western side of which there is an entrance to the boys' shelter.

In both cases, although the shelter entrances are within the school's boundary, the shelters themselves lie under ground outside it. Ownership is claimed by Reigate & Banstead Borough Council, with stewardship assigned to the school.



Toilet recess in the boys' shelter; note the 'two seater' toilet -
Photo by Bob Clary

Rediscovery of the shelters

At the suggestion of the Head Teacher, a former pupil, Alan Moore (a noted local historian of Redhill with at least two earlier published books to his name), was invited

in 2001 to write a history of the school. In the course of reading the school log books for the war years, references were found to paintings on the wall of the boys' shelter. These had been filmed, and featured in the media of the day.

In the spring of 2003 Martyn Rout (the school-keeper) reopened the shelters, accompanied by Alan Moore. The girls' shelter was found to be the larger of the two, but contained relatively little of interest. The smaller boys' shelter, however, was found to have had its walls covered in mural decorations. A lottery grant has been secured to safeguard the shelters as an educational resource, and to allow for occasional public access.

The girls' air-raid shelter

The 'girls' shelter' (designed to accommodate junior girls, mixed infants, and apparently miscellaneous adults 'at large' in the neighbourhood) lies between the schools' northern playground and a minor roadway (a western extension of King's Avenue) between the schools and the common. It is a cut-and-cover concrete lined structure, underlying an area of grassland and shrubs. The entrance is a straight flight of steps down at the northern edge of the playground.

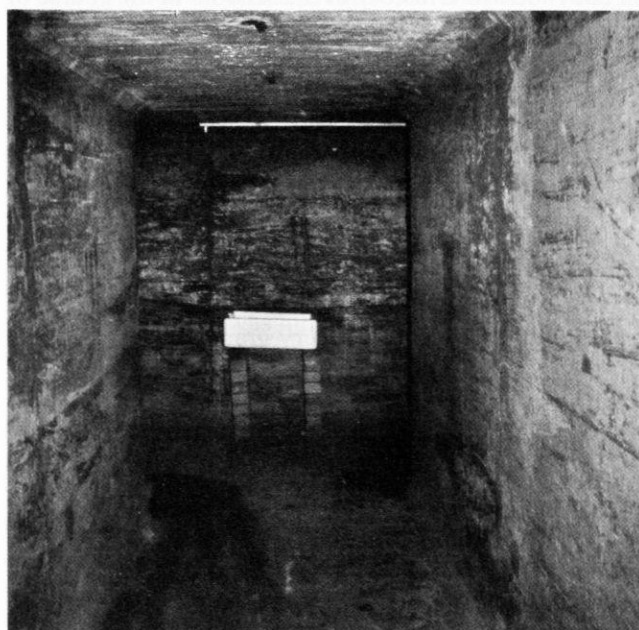
It is fairly featureless, although alcoves had clearly been fitted with two-seater toilets and, perhaps, modesty curtains (across the front only, not between the two seating positions!). There was no main drainage from these: just little more than buckets. There are also one or two emergency escape hatches (manhole covers) in the ceiling, but no trace of any access ladders to go with them.

The boys' air-raid shelter

The smaller 'boys' shelter', of similar construction, is entered from the western edge of a 'middle' playground between the two main school building blocks. Here, a flight of concrete steps descends, from within a small brick enclosure, by way of a right-angled turn leading below the school's boundary wall. As with the girls'



Entrance to the Boys' shelter - Photo by Bob Clary



Typical tunnel in the boys' shelter - Photo by Bob Clary

shelter, the protected area is outside the school walls, and underlies open land to the west, where some ventilation heads can be seen.

This shelter occupies an area about 20 metres square, and comprises three approximately north-south tunnels linked by two cross tunnels. There is a plan in Moore's history of the school. As with the Girls' shelter, there are alcoves which accommodated (behind curtains) double-seated bucket toilets; there are also several emergency escape hatches in the ceiling, although again no ladders survive. One corridor just inside the entrance is obstructed at floor level where a sewer pipe (protected in concrete) crosses it.

Board of Education Circular 1535, issued on 18 December 1940, stated that 'time spent in shelters is not time wasted.' The teaching staff at St. John's Junior

Boys' School appear to have ensured that their 272 pupils aged 7 - 11, in rather cramped conditions in five parallel shelter tunnels, were kept busy. The walls are decorated with painted murals depicting scenes from *Beowulf*, *Gulliver's Travels*, *Pilgrim's Progress*, *Robin Hood*, *Robinson Crusoe*, and *Snow White*. These appear to have been painted during 1941, and were inspected by the School's Governors in April that year, filmed by Pathe on 7 July, and recorded by Fox Photos on 31 July. The surviving murals are also associated with some pencilled graffiti. Archaeological examination of the paints used, their modes of application, and other features (including splashes and dribbles) lead to speculation concerning the conduct of the children and their supervising adults.

This unusual survival is now being put to educational use again. The school has made a DVD of the murals, and hosts conducted shelter tours from neighbouring schools. More information is at the website www.stjohnsschoolredhill.co.uk

Acknowledgements and thanks

We are most grateful to the Governors and Head Teacher at St. John's for granting permission for our visit, and especially to Martyn Rout for his enthusiastic and knowledgeable guidance. And to Mike Stace for making all necessary arrangements for the visit, for lunch at the nearby *Plough* later on, and an after-lunch visit to the Tunnel Road East sand mines at Reigate.

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Painted murals in the boys' shelter - Photo by Bob Clary

UK Shelter Policy 1924 -1945

Robin Woolven

Many articles in this and other journals describing the subterranean structures used as air raid shelters in the Second World War correctly place those structures in the context of the government's 'deep shelter policy.' However, shelter policy – deep or otherwise – took a long time to emerge and was then subject to significant changes over time so this article will trace the problems and evolution of shelter policy and will mention projects that were started as part of, or in spite of, that national policy.

Aerial bombardment of the civilian population during the First World War not only caused 1,413 deaths and injured another 3,407, but naturally caused many people to seek shelter, mainly under railway arches, in the basements of large buildings, in underground railway stations or in caves and tunnels. But there was no formal 'policy' on the construction or use of those shelters however, and with the vast increase in the effectiveness of aircraft by 1918, the protection of the civilian population was a major concern in any future war. In 1924, the Committee of Imperial Defence (CID) established an Air Raid Precautions (ARP) sub-committee 'to examine the whole question of the protection of the civilian population against air attack'.

The ARP Committee was chaired by Sir John Anderson, the Permanent Under-Secretary at the Home Office, and comprised officials of the Whitehall departments whose main concerns were warning, prevention and repair of damage, maintenance of vital services, movement of the seat of government, legislative powers required and departmental responsibilities, while only brief mention was made to the provision of air raid shelters.

The representative of the Office of Works had suggested that public shelters could be provided by excavating additional tunnels under the tube railway lines but, costed at £2,000,000 per new line, this was ruled out by Sir John Anderson who commented that 'the Government would require convincing proof before the authorities would be prepared to undertake considerable expenditure in anticipation of war'.¹ The sub-committee explored the possibility of constructing large air raid shelters but no publicity on their discussions was permitted as public opinion, with its memories of the recent 'war to end all wars', did not wish to think of another war.

Not until July 1935 did the Home Office set up a small ARP Department, under Wing-Commander E J (later Sir John) Hodsoll, whose first task was to announce government policy by issuing to local authorities the *First Circular*. This disclosed that a policy of 'dispersal' would be adopted rather than constructing air raid shelters, as protection against direct hits by bombs would require 'concrete structures of great thickness or correspondingly costly works of equivalent strength [so] it will be for

occupiers of premises to provide for themselves and their households'.² With the primary threat considered to be from poison-gas bombs, householders were advised to construct their own anti-gas

refuges, Hodsoll later recalling, "with the assistance of the Imperial Tobacco Company [we] produced a set of Churchman's [and later Wills], cigarette cards which constituted the first advice householders had had – an unlikely sideline on the Government's general soft-pedal attitude".³

The 1937 ARP Act made compulsory the taking of ARP measures by local authorities, but although some private companies sold air raid shelters, there was no requirement for any wider shelter provision. As the international situation continued to decline through 1938, local authorities were instructed to survey public and private basements to assess their availability for strengthening should the situation demand, and there was still no national provision of shelters when the September 1938 Munich crisis broke upon the country.

The armed forces were mobilised and the ARP Services called to their stations, 30 million gas masks were issued to the public and local authorities strengthened basements and excavated trench shelters in public squares and parks. But the crisis faded, having found the armed forces and the home front grossly unprepared for the war that had been thought inevitable and imminent. Perhaps the greatest benefit flowing from the Munich inquest was the appointment of Sir John Anderson, now an MP, as Lord Privy Seal as Minister of National Service and Civil Defence.

Anderson hastened preparations and developed a shelter policy for the protection from high explosive (HE), gas and incendiary bombs of households, people at their place of work and 'caught in the streets'. But shelters had long been a sensitive and often a political issue so government policy had to contend with the measures being advocated by a range of 'experts' who often carried strong and critical political affiliations – not the least being biometrics Professor J B S Haldane who had observed shelters in Barcelona during the Spanish Civil War and whose authoritative book *ARP* was published during the Munich crisis. Haldane's proposals included the excavation of many miles of 7ft diameter tunnels below ground into which Londoners could disappear on hearing the air raid warning. Haldane claimed that:

In a 7 foot tunnel with benches at the sides, 3 large men could sit per yard of length. Actually 4 average





Queuing for a typical trench shelter

people per yard could be accommodated comfortably ... the cost per person sheltered would be £6.5s and there would be room for others standing.⁴

Dealing with the whole shelter question, in December 1938 Anderson appointed three of his leading engineering contacts⁵ to a small committee “to consider certain aspects of the Problem of Air Raid Shelters”. The trio reported, on 20 December 1938, their:

whole-hearted agreement with the Lord Privy Seal that the provision of a shelter in or in close proximity to the home of every citizen in vulnerable areas is a sound policy, and that such a shelter should provide reasonable protection against blast and splinters from the near-by explosion of a medium-sized HE bomb and against the collapse of the super-structure.

The main conclusion of the committee was that:

the magnitude and urgency of this problem are so great that the utmost possible use should be made of the resources of every trade that can be employed on the work in the construction of all forms of shelter accommodation ... at the utmost possible speed, viz.:

- a. Pressed and rolled sectional shelters
- b. Propped basements
- c. ‘Pill-boxes’
- d. Permanently strengthening lower floors of blocks of flats and tenements
- e. Permanently strengthened basements of shops, offices and large houses
- f. Communal shelters and trenches.

Only by these means can we conceive that the necessary accommodation will be made available within a reasonable period of time.⁶

Their support for the sectional steel shelter resulted in the adoption of Oscar Kerrison and Sir William Patterson’s patented ‘Anderson’ shelter as the standard provision to households with space to erect them, semi-submerged, in their gardens. By the time that war was declared several millions of four- then six-person Andersons had been delivered *gratis* to most households or sold to those earning over £250 a year for £7.10s.

But the Anderson was only splinter- and blast-proof and certainly not ‘bomb-proof’, i.e. able to survive a direct hit, and this lesser degree of protection generated demands for more comprehensive protection. The demand was from those who had observed – or had read of – underground shelters used as refuges in the Spanish Civil War: caves, tunnels or other ‘deep’ shelters excavated and covered with concrete and topped with layers of earth to render them ‘bomb-proof’ from a direct hit by HE bombs. Led by J B S Haldane, people demanded that the government announce a programme of Exchequer-funded deep shelters for the public. The pioneering local authority was Finsbury Metropolitan Borough Council who, in January 1939, announced their ‘Finsbury Deep Shelter Plan’ which claimed that:

“... only four times the money spent on trenches would give twenty times the level of protection obtained, if the shelters were big enough”⁷



Anderson shelter

Headed by Councillor Riley, the Council retained Berthold Lubetkin’s avant-garde architectural firm of Tecton, recently acclaimed for its ‘Finsbury Health Centre’, who used the concrete specialist Dr Ove Arup (of London Zoo’s spiral concrete ‘Penguin Pool’ fame) as consulting engineer. Arup surveyed Finsbury’s ARP needs and proposed a series of 15 underground, descending spiral, bomb-proof shelters each holding up to 12,000 citizens, located to enable all citizens to reach their shelter in about seven minutes following the sounding of the air raid warning.

This seemed to many to be the complete answer to air raid protection and demands for similar schemes were made in many Boroughs. But large and costly bomb-proof shelters were at variance with the Government’s stated policy of dispersal into small blast-proof shelters. Many Councils, particularly St Pancras and Lambeth, were bombarded with similar proposals by groups often backed by the Communist Party or local Trades Councils. Boroughs invariably agreed to take no further action on such proposals pending the investigation of the Finsbury Scheme.

Meanwhile, in February 1939, Sir John Anderson set up a ‘Conference’ of the knowledgeable great and good⁸

to advise him on 'certain aspects of air raid shelter policy', in fact to consider 'the problem of the provision of heavily protected shelters... and the issues underlying the problem...' After considering such constraints as the warning time likely to be received, the difficulties of walking at night in the blackout and reaching shelter entrances, and conducting their own research on the rate at which crowds moved through entrances to football grounds and railway stations, Hailey's Conference decided against large 'focal' shelters such as those proposed by Ove Arup and Berthold Lubetkin for Finsbury Metropolitan Borough Council

Instead, the pioneering proposal was for the aforementioned underground, descending spiral, bomb-proof shelters each holding up to 12,000 citizens. Such shelters were claimed to be the complete answer to air raid protection and demands for similar schemes were made in many boroughs. Hailey warned that such deep shelters could well involve:

dangers such as those of creating a shelter mentality, of interrupting the processes of essential production, or of unduly diverting national effort from other measures of defence. No one of these need be decisive in itself, but, taken in combination, they must be an important element in the determination of policy.⁹

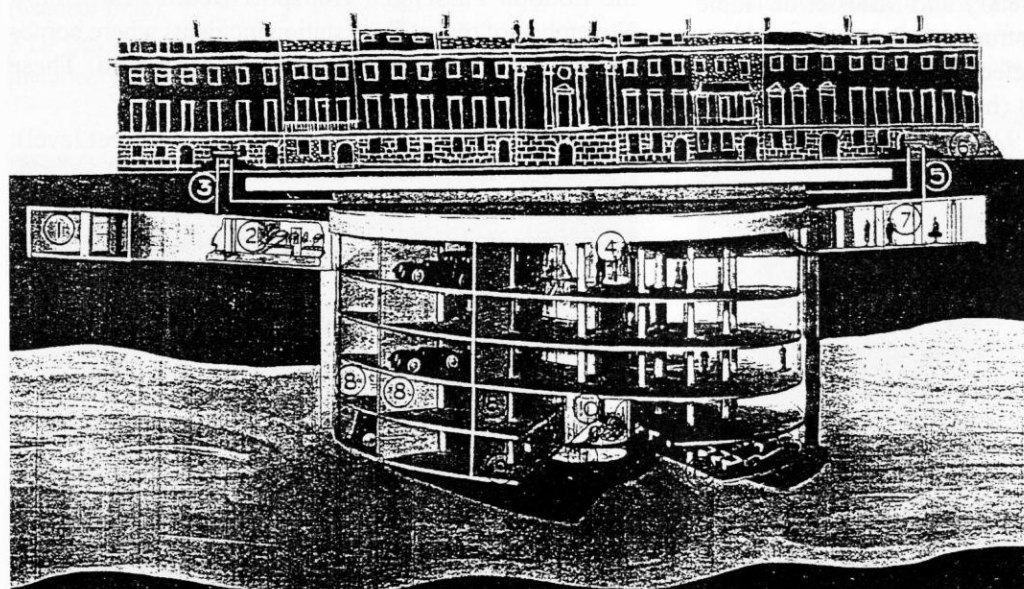
Turning to tunnelling, significantly for future policy, the Committee:

...had the advantage of having had before us a consulting engineer who has an exceptional experience of tunnelling work, [who clearly stated] ... that conditions in the majority of streets in our large cities exclude the possibility, which was exploited to some extent in Barcelona, of surface working as [mains etc] occupy the whole of the under-surface of our main streets, and below this ... lie the sewers.

Extensive experience of underground railway work in London points to a very definite limit to the maximum rate at which – taking into account plant, supervisory staff, and labour – work could be carried out, even if other demands on this section of industry were substantially reduced. [Further]... the question of tunnels of the 12ft diameter, for which the readily available types of excavating plant are adapted, ... we could not confidently count upon constructing in London, within a period of two years, sixteen miles of such tunnel shelters. This length of tunnel would have the capacity to house some 160,000 persons. Any such extension of this figure as we should regard as reasonably possible would make very little impression on the problem of the country as a whole. ... by making tunnels of 16' 6" diameter, capable of accommodating refugees on two storeys, the number of persons for whom such accommodation could be constructed in a given time would be considerably increased. We doubt, however, whether this expedient would be of practical value, for while a 16' 6" tunnel is estimated to hold about 30,000 persons per mile, there must be few, if any, places where the corresponding concentration of population (say, 200,000 to the square mile) would be located near enough on either side of the tunnel to enable advantage to be taken of the additional accommodation so available. Indeed, a tunnel of such large capacity must approximate in character to a typical focal shelter, and be subject to the difficulties and drawbacks which we have already shown to be associated with such shelters. It seems clear, therefore, that the construction of tunnel shelters must, if they are to be completed in any commensurable time, be restricted in extent.

When they reported in April 1939, Hailey's conference was critical of the Government, stating:

Not until the Government is able to make public the full extent of the shelter measures contemplated can it hope to gain general support for its policy and thus ensure that both local bodies and individual citizens shall effectively recognise their responsibility for taking their share in the preparations against attacks by air. ... There can be no doubt as to the strength and



1 Entrance Ramp, 2 Air lock and first aid post, 3 & 5 Air extract (peacetime) or intake (wartime),
4 Lift for garage use in peacetime, 6 Entrance to ramp from street, 7 Ramp, 8 Baffle walls,
9 Storage space, 10 Lift motor, 11 Water sump, 12 Ventilation fan and water pump, 13 Gas filters

insistence of the public demand that measures for protection against air raids should be systematically and unhesitatingly pressed forward.

Hailey generally supported the Government objection to funding heavily protected (and thus 'deep') shelters and Anderson pushed forward with the Civil Defence Act (1939), the main provisions of which related to local authority responsibility for constructing public air raid shelters, primarily authorising local authorities to designate and strengthen private properties as public shelters, and to construct brick surface shelters for residents without the space for Andersons and for members of the public caught in the open. Annoyed at the rejection of their scheme, Councillor Riley in Finsbury and his Town Clerk acted independently and quite illegally by, without the knowledge of the full Council, contracting a company to construct one of Arup's shelters in Busaco Street, Finsbury. The operation of the 'war clause' ended construction but it was not until 1944 that the Lord Chief Justice supported the District Auditor's decision to surcharge both men and debar them from further local authority work.

Back in 1939 Anderson had hastened ARP measures and shelter provision by urging local authorities to make them their top priority. Thus by the outbreak of war, and with the extra year of preparation afforded by the 'Phoney War', by the time the onslaught from the air arrived in August/September 1940 shelter accommodation, although far from universal, was extensive. The experience of the initial weeks of the blitz on London, however, highlighted some serious gaps in national preparations.

The three problems in the London Region of homelessness, clearance of debris and of shelter provision were dealt with by the creation of Special Regional Commissioners. On 4 October 1940, Herbert Morrison MP was made Home Secretary and Minister of Home Security. Although the construction of a number of 'deep shelters' excavated under selected tube stations had been discussed for some weeks (having been suggested by the Ministry of Works in 1924 and again mentioned by the Hailey Conference), it fell to Morrison to bring the scheme to Cabinet whereupon Sir John Anderson, now Lord President with an oversight of home front matters, succeeded in insisting that the decision:

... did not represent any fundamental departure from existing [shelter] policy. ... to extend the Tube shelters linked to the Tube system would require very careful handling. There was a risk that, if this proposal was taken up by the public in the wrong way, it might be used to discredit the whole of shelter policy. The question was one of emphasis in presentation ... the [Minister's] statement should not be represented as a reversal of existing policy.¹⁰

Morrison's amended script¹¹ concentrated on his aim of providing 'More and Better Shelter' by announcing that he would continue surveying basement shelters, providing

more surface communal shelters, more steel for the building of larger Anderson shelters and extending the smaller ones to 6 feet for the taking of bunks. He then turned to the question of deep shelters on which he had:

... consulted the best expert opinion, including some fresh minds and I have come to three conclusions:

a. Anything like a universal policy of deep shelter, for the whole people or the greater part of it, is beyond the grounds of practical possibility.

b. No appropriate amount of deep shelter, even in the most favourable event, can be ready until this winter is over.

c. In some places and in some circumstances, the construction of deep shelter is practical and will be undertaken. The deep shelter provided in London by the Tubes will be extended by tunnelling. Other matters ...

Remember however that public shelters are not everything - far from it. Even in London the larger public shelters are used by less than one in six of the population as 85 percent sleep in their houses and flats with local protection, in their Anderson shelters or in communal public shelters.

Referring to Haldane, Morrison then cautioned:

Be on your guard against all who seek to make this deep shelter cry a means of defeatist agitation. Political schemers ... who seek to destroy our will to take risks by a means of defeatist agitation ... Hitler is no doubt delighted with their manoeuvres. He knows that if our people could be stampeded into putting a narrow personal safety before success, he would win.

The Cabinet were aware that fatalities still occurred if bombs penetrated deep into Tube railway stations and the London Passenger Transport Board heard, on 7 November, of recent Tube station incidents where bombs caused considerable damage far underground. These included fatal incidents at:

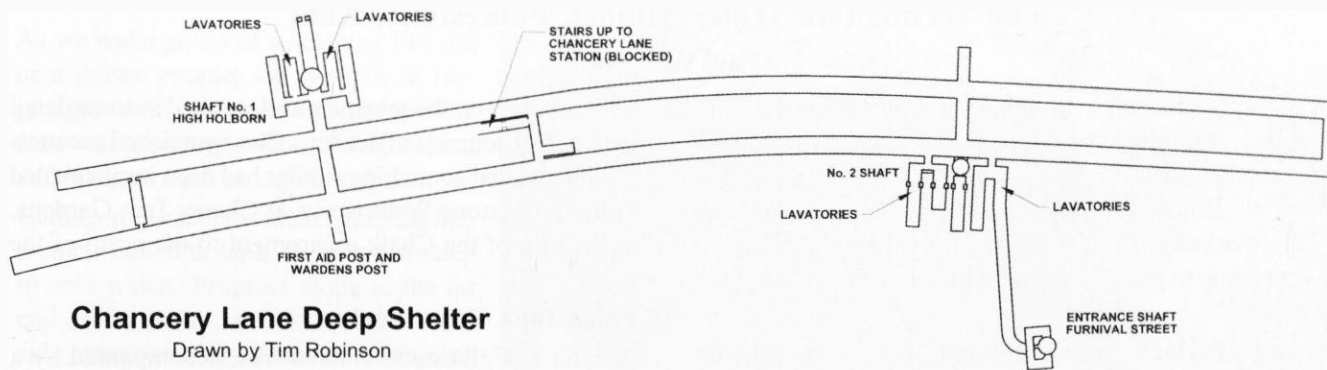
Trafalgar Square (40' crater, 42' below street level); Bounds Green (37' below street level); Balham (70' diameter crater containing 5,000 tons of clay) and two incidents at Euston (47'6" and 56' below street level).

¹²

Hailey's warning that even deep shelters could not ensure safety was further demonstrated by the Bank Tube incident of January 1941 which killed 111 people, after which Morrison's Executive Sub-Committee again discussed 'the extravagant claims of Professor Haldane' although:

... the agitation for deep shelters was now thought to be less active as a result of recent incidents e.g. the bomb explosion at Bank Station. It was suggested that discrete publicity might be given to some of these incidents. [Morrison] said he would ... consider this ...¹³





Chancery Lane Deep Shelter

Drawn by Tim Robinson

With the new Tube shelters, authorised in October 1940, generally completed in 1942 and (some) eventually opened to the public in 1944, shelter policy remained with only minor amendments over the next five years. Amendments included the strengthening of surface shelters, the provision of 'bunking' and 'ticketing' in the larger shelters, the distribution of more Andersons and the steel 'table-top' Morrison shelters in preparation for the feared V-weapon campaign.

However some comments are appropriate and might appear in a future issue as, with all the benefits of hindsight, shelter policy and such reports as Hailey's are often criticised as inadequate, having left the nation, and Londoners in particular, unprepared for the blitz and the later V-weapon offensives.

Notes

- 1 TNA CAB/46/1 7th Meeting of ARP Sub-Committee p.12 - 27 October 1924
- 2 First Circular 9 July 1935 para.8
- 3 Churchill Archives, Cambridge, Hodson Papers, 6/1 Chapter 11 - The Great Awakening
- 4 J B S Haldane ARP, p.167, Gollancz, The Left Book Club (October 1938)
- 5 Dr David Anderson, Mr B L Hurst and Sir Henry Japp, all members of the Institute of Civil Engineers.

6 Air Raid Policy Cmd. 5932, January 1939.

7 *The Star* 18 January 1939.

8 Under the chairmanship of the former Indian Civil Servant Lord Hailey (Chairman Air Defence League 1937-38) the other conference members were George Hicks MP (Labour, East Woolwich), Sir Clement Hindley MInstCE (a Railway Tunnelling Specialist), F J Leathers (shipping expert later, as Lord Leathers, Minister of War Transport), Dame Louise McLroy FRCP (Professor of Obstetrics), Sir William McLintock (Chartered Accountant), F J Marquis (businessman and later, as Lord Woolton, Minister of Food) and Professor Sir Richard Southwell (Government Aeronautical Scientist).

9 Air Raid Shelters Report of the Lord Privy Seal's Conference, Cmd. 6006, April 1939

10 TNA Cabinet Conclusions 280 (40) 30 October 1940

11 *The Listener* dated 7 November 1940

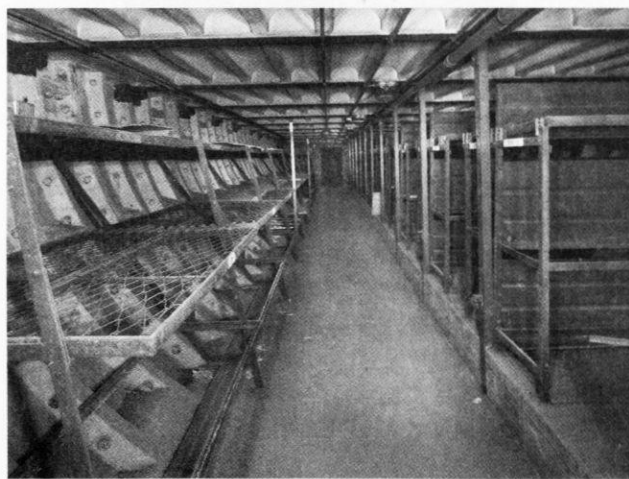
12 LTPT Board Minutes at MRO Ref 1297/LPT01/05 dated 7 November 1940 - in London Metropolitan Archive

13 TNA CAB 75/3 5th Meeting 16 January 1941

In the next issue having described the evolution of Air Raid Shelter Policy and the rejection of deep shelters by Lord Hailey's Conference, Robin Woolven will comment on aspects of the implementation of the Government's policy and consider the validity of some of Lord Hailey's warnings of the potential problems of deep shelters. Finally, the extent to which the various types of shelter were used by the public will be detailed.



Typical shelter in WW2 (probably Stockwell)



Bunks still in place in the Camden Deep Shelter in 2000
Photo by Nick Catford

The Terlingham Water Tunnel, Folkestone, Kent

Paul W. Sowan

It is, today, difficult to imagine the proprietors of a long, flooded, crumbling chalk tunnel under the North Downs, last visited in 1947, inviting a small group of strangers to visit it! But that is just what happened at Folkestone Waterworks in or about 1981. This is how this unlikely event came to pass, along with a description of what we saw.

George Taylor's 'upward boring for water' scheme of c.1899 at Reigate

My researches into, amongst other things, Reigate Mines Ltd's hearthstone mine at Colley Hill, Reigate (closed about 1961) led me to discover an account (ANON, 1900) of a scheme to convert the mine into a source of water for the town. This was a small privately operated public water supply system, competing in a small area on the crest and at the foot of the North Downs with the town's main supply. It was operated by one George Taylor [1840 – 1912] who had taken the mine over from previous operators in the 1890s. His main water supply was pumped from a deep chalk well on the top of the Downs. His reasoning seems to have been that he could save pumping costs if he could tap water out of the Chalk aquifer in such a way that it would run by gravity alone to the properties he supplied at the foot of the escarpment. His hearthstone mine tunnel (the entrance to which is now blocked) runs in from the foot of the hill in the Upper Greensand, the next stratum below the Chalk. Water in the more permeable Middle Chalk was held up by the relatively impervious clayey Lower Chalk.

Taylor proposed to tap the available water by boring a series of vertical holes in the mine ceiling, through the impervious stratum to the water-bearing rock above it. In the event, this scheme seems not to have been fully implemented and, indeed, Taylor sold his water supply business to the East Surrey Water Company in or about



The Sub Brit party preparing to enter the tunnel in 1987
Photo by Peter Burgess

1906. However, the scheme was described in some detail in two trade journals of the day. These published accounts mentioned that something similar had been implemented at the Folkestone Waterworks at Cherry Tree Gardens, at the foot of the Chalk escarpment to the north of the town.

Folkestone Waterworks

A letter to Folkestone Waterworks, accompanied by a photocopy of the 1900 article, brought back a prompt and interesting reply. The engineer confirmed they did indeed have a 'horizontal well', and that it was still in use as a source of water. However, there had been no access since 1947, when a geologist from the Geological Survey had inspected the tunnel. A photocopy of the geologist's report was enclosed. There is no Upper Greensand bed at Folkestone, so this tunnel is in the Lower Chalk. The engineer thanked me, especially, for telling him something about his own well of which he had not been aware; the vertical boreholes in the tunnel ceiling. That seemed to be the end of that. My 'horizontal wells' file was closed for the time being.



Sub Brit's former secretary Malcolm Tadd in the lined section of tunnel near the entrance - Photo by Michael Jack

Some years later, much to my surprise, a further letter arrived from Folkestone. The tunnel had been opened-up for some maintenance work, as the outer end was in a state of collapse. Provided I didn't mind getting wet, perhaps I might like to explore! This, you will understand, was back in the days when small local concerns were run by human beings. Now we have huge faceless corporations run by bean-counters, and employing health and safety nannies! A couple of telephone calls later, I had permission to take a small group down to Folkestone (all of whom were not to mind getting wet) so I assembled 'the usual suspects' including Nick Catford, Peter Burgess, Harry Pearman, Malcolm Tadd, and others.

The water tunnel

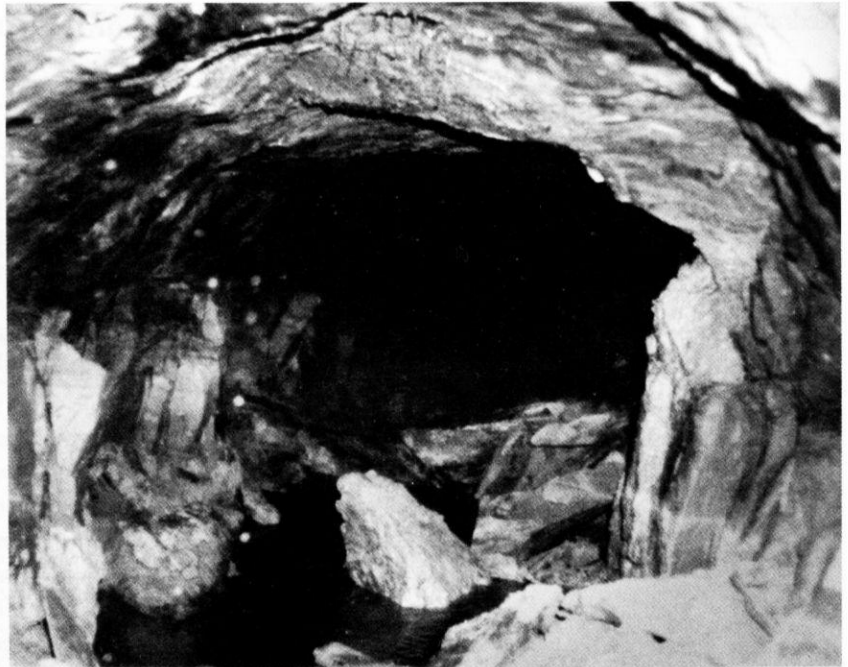
As we had a group of something like ten or a dozen people, we went in in two groups. An ex-National Coal Board safety man was assigned to lead each group in, and bring us back out again safely.

Getting into the tunnel meant jumping into a small concrete tank about waist-deep in cold water. Progress along to the far end of the tunnel, and down two shorter side arms, was slow at first. The going was made difficult as huge blocks of chalk, fallen from the ceiling, had ponded-up the water in places. Clambering up one side of each fallen block, and sliding down the other side was good exercise, and the cold water quite refreshing! The safety man insisted on prodding the roof at frequent intervals with a stick carried for that purpose! 'Keep well back, lads', he said cheerfully. We certainly did! Prodding a coal-mine ceiling which is inspected every day is one thing, but in a crumbling tunnel not entered for over thirty years it is another.

The tunnel is of course not quite horizontal. It slopes gently uphill inside the hill, to facilitate the outflow of water. We easily confirmed the existence at intervals of the two-inch diameter vertical boreholes in the ceiling, a prolific supply of more cold water down our necks. But by then we were hardly in a position to get any wetter than we already were.

Eventually, we were in the innermost part of the tunnel, where the roof is sound and in the right place, and the water shallowed, until eventually we were just walking along a gently sloping floor with no more than a trickle of water running along it. Then we came to the crossroads. The right-hand end was followed to a dead end. The left-hand end passes a deep water-filled sump the full width of the side tunnel, at the bottom of a wide shaft up to the top of the hill above us. This is capped, but a small hole admitted a little daylight. We were more or less in sight of the dead end of this left-hand tunnel, so returned to the crossroads and completed the visit right up to the end of the main tunnel. On the way back out, our safety man stumbled and his waist-length waders filled up with water. This evidently cooled his enthusiasm, as he turned to me and said, 'Well, you know the way. Why don't you take the second group in?' So I did (but refrained from poking the dodgy-looking ceiling back towards the entrance).

An unanswered question, in retrospect, concerns the purpose of the wide vertical shaft, the top of which we did not visit. Presumably it was primarily for tunnel-spoil extraction, as if all spoil had to be taken out via the main tunnel this would have made for slow progress.



Progress through the tunnel is made difficult by blocks of chalk that have fallen out of the roof - Photo by Michael Jack

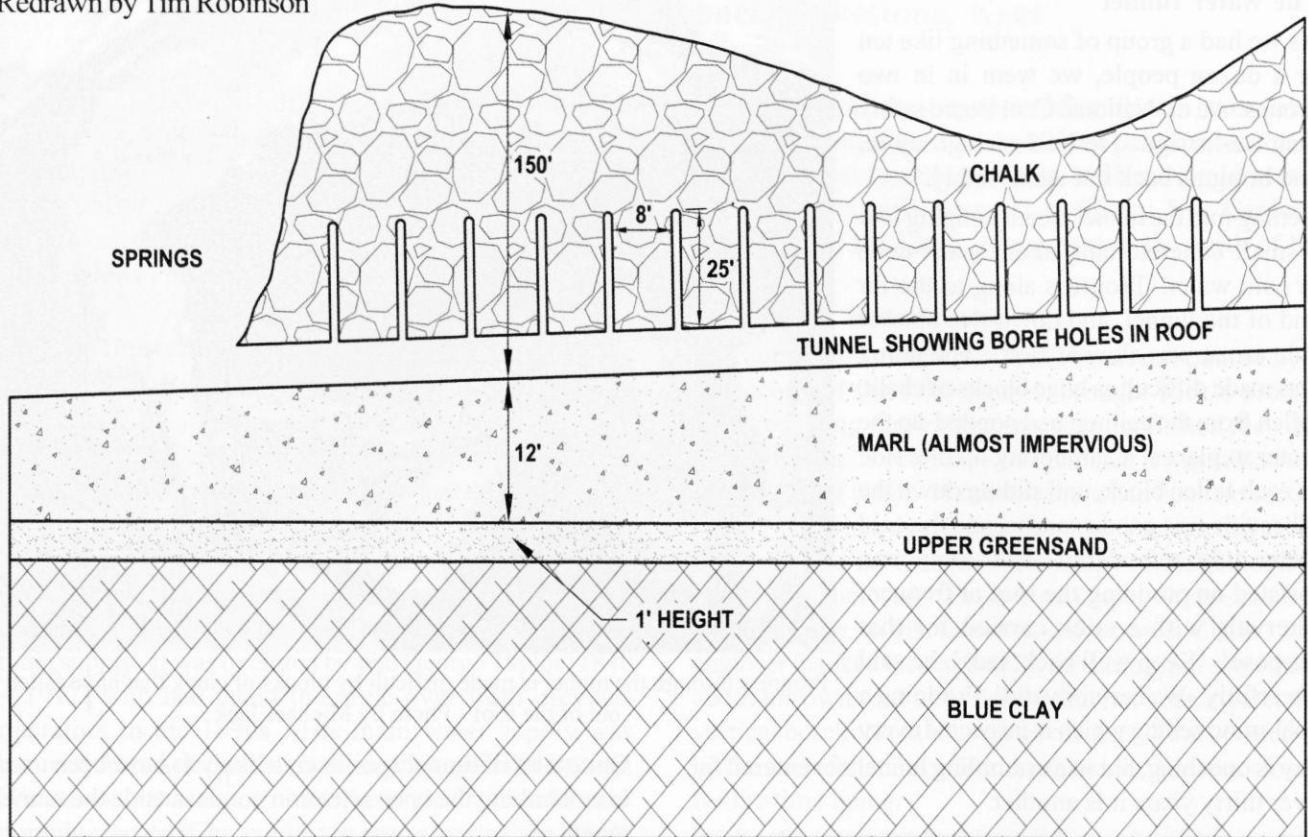
Quite a lot of tunnel spoil seems likely to have been used in embanking the open retention ponds outside the tunnel mouth.

Horizontal wells in general

A 'horizontal well' appears, according to Rees, to have been driven into the Chalk of the Chiltern Hills as a feeder to the Grand Junction canal between Tring and Wendover. One Joseph Lucas [1846 – 1926] (an entertaining character who was sacked from the Geological Survey staff for being in the wrong part of the country when he should have been mapping elsewhere!), who spent most of his career as a freelance water supply consultant, published a book on *Horizontal wells* in 1874. In this he advocated the driving of very long (up to fourteen miles) tunnels in the upper reaches of the North Downs, from which water was to flow downhill to London, saving (as Taylor had hoped at Reigate) pumping costs. His scheme was not proceeded with, but he did collect and publish a very useful and interesting mass of data for wells in the chalk around London and elsewhere.

Although simple horizontal wells for water supply are uncommon (there are probably a few other examples I've not yet found), they do frequently feature as adjuncts to the more usual vertical wells. Whitaker, for example, records that at several levels in the 200 feet deep Addington well (near Croydon) there are 'galleries in various directions' of which the longest is 291 yards. Such galleries were driven to intersect water-bearing fissures, and so increase the yield.

As Harry Pearman remarked after our visit, this was something of a connoisseur's outing. Several accounts were published soon after the visit, listed below.



Longitudinal section of the Terlingham Water Tunnel at Folkestone, described by Henry Turner, Engineer to the Folkestone Water Company. The tunnel, six feet high and five feet six inches wide, was driven northwards into the foot of the Chalk escarpment, commencing at a portal 220 feet above sealevel, and rising at a gradient of one foot in 144 feet, to allow tapped water to flow out. The tunnel was equipped, in or before 1900, with a tramway. The main adit is 540 yards [498 metres] long. At 455 yards [420 metres] from the entrance there are side galleries. That running eastwards is 59 yards [54 metres] long; the side-tunnel running westwards from the same point has a length of 95 yards [88 metres], although (as observed when visited) at an unstated distance it is interrupted by a sump the full width of the gallery, above which a vertical shaft of the same diameter rises to the surface. Boreholes 2 inches [6.35 cm] in diameter were drilled vertically upwards from 20 to 25 feet [six to eight metres] into the ceiling every eight feet [2.5 metres]. The sump and shaft are not mentioned in the original description; and the tramway had been removed by the time of the visit recorded here. The section and details are from a paper (probably by George Taylor of Reigate) entitled *Upward boring for water: proposed scheme for Reigate and Redhill*, published 1900 in *Water* 2, 256 – 265; and also in *The Quarry* 5(8), 331 – 344.

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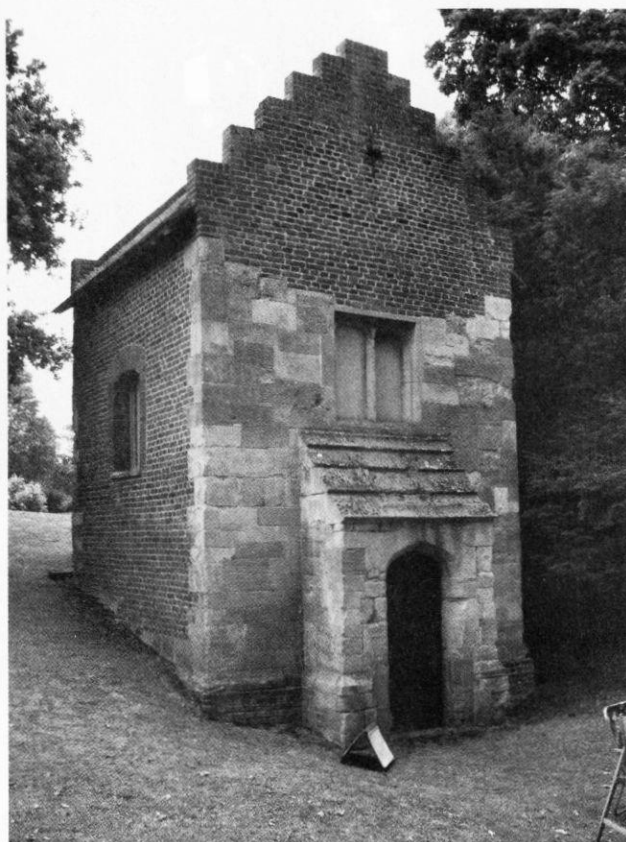
Coombe Conduit House

David Gordon

Coombe Conduit House, a Scheduled Ancient Monument in Kingston-upon-Thames (TQ 205699), forms part of the original water supply to Hampton Court Palace. The complex consists of two towers of Tudor date, connected by a subterranean passage 24.7 metres long, with an entrance in the lower (western) tower. The structure is mainly of brick, with ornamental stonework to the front and corners of the entrance tower, and one course of chamfered stonework near the base of the upper tower. The interior is of brick, with a tiled floor three steps below the level of the entrance door. The lower tower and tunnel are complete structures. The upper tower sustained bomb damage in 1940-1 but remained largely intact until 1943, when two trees fell on it during a storm. Little now remains above ground level, but there is still a substantial underground space, part with its original brick vault and part with a modern roof.

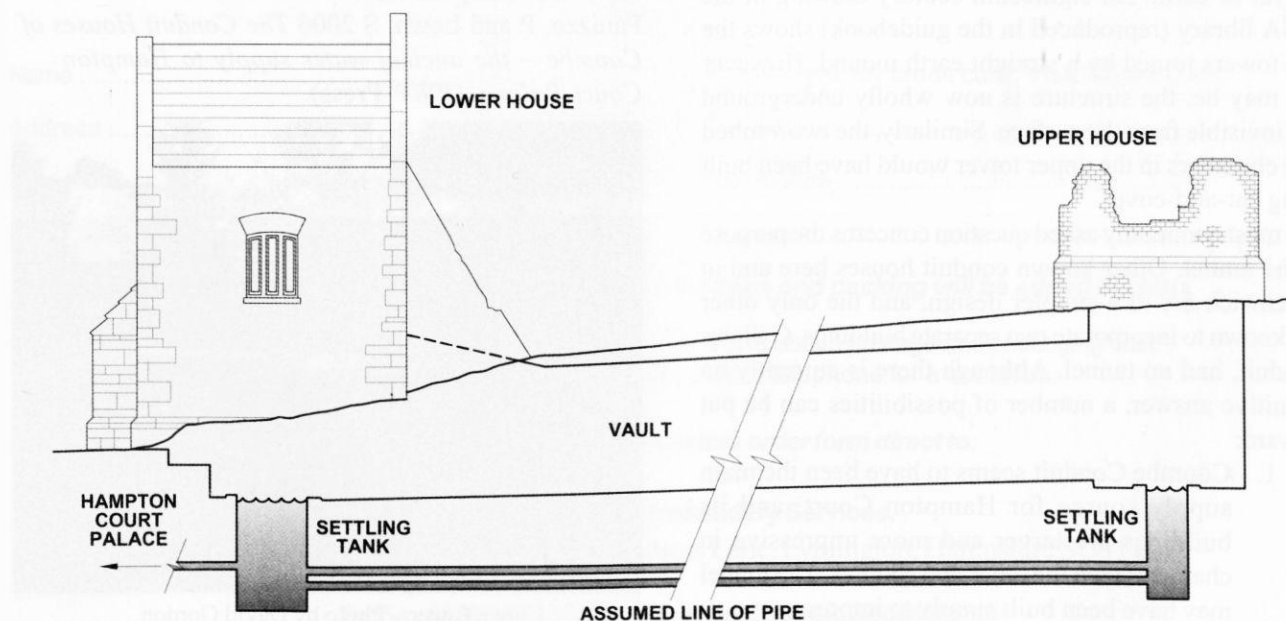
The plan of the upper tower has been altered several times. Spring water was collected in a tank and allowed to settle before being piped beneath the floor of the tunnel to a second tank in the lower tower. Changing water tables required the construction of two brick-vaulted side chambers, the north chamber at a higher level and the south chamber at a lower level. In all three cases the purpose was to collect and store the spring water, allowing it to settle before onward transmission. Water still flows into the system today, and follows the original pipework to another tank in the lower tower, whence excess is piped to local soakaways.

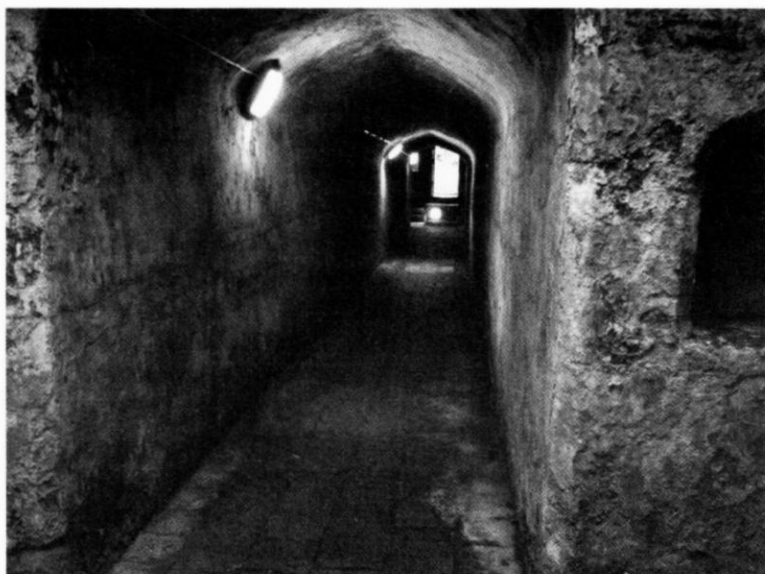
Originally the water continued downhill in underground lead pipes, via a number of 'tamkins' – small buildings which probably housed further tanks for storage and settling as well as stopcocks to allow maintenance work. One tamkin, set on an adjacent pipeline, survives on the



Lower Tower - Photo by David Gordon

nearby golf course at TQ 199700 (note that although also a Scheduled Monument, the building does not appear on OS maps and the location is incorrectly shown on the official English Heritage map and on the MAGIC map). It was carried under the Thames at Kingston in lead pipes, and it was damage to this section by shipping, as well as increasing contamination of the supply, which led to the eventual abandonment of the system in 1876. The pipes





Tunnel - Photo by David Gordon

were carried under local roads in substantial brick culverts. One excavated in the early twentieth-century under Coombe Lane West was big enough for a man to walk through. A plan in the 1930s to bottle and sell the Coombe spring water failed as the water was considered too polluted for human consumption. In 1940 arrangements were made to route the water into a storage tank for emergency public supply, but it is not known if this was ever used.

No records exist of the original construction, but it is likely that Coombe was the first and most important of the three local sources of supply (the others being at nearby Ivy Conduit, which has a much simpler arrangement, and Gallows Conduit, which resembles the system at Coombe but without the underground passage). It is not clear whether the tunnel between the two towers was originally underground. The main structure would certainly have been built above ground, then covered at some point with a layer of earth. An eighteenth-century drawing in the RIBA library (reproduced in the guidebook) shows the two towers joined by a straight earth mound. However this may be, the structure is now wholly underground and invisible from the surface. Similarly, the two vaulted side chambers in the upper tower would have been built using cut-and-cover.

The most commonly asked question concerns the purpose of the tunnel. Other known conduit houses here and in Greenwich are of a simpler design, and the only other one known to incorporate two separate buildings, Gallows Conduit, had no tunnel. Although there is currently no definitive answer, a number of possibilities can be put forward:

1. Coombe Conduit seems to have been the main supply source for Hampton Court, and its buildings are larger and more impressive in character than the other two sources. The tunnel may have been built simply to impress.

2. Security was a major issue. The conduit houses were strongly built, with lockable doors and barred windows, and surrounded by thorn plantations. Sinking the building partly underground and providing only one door to the complex would help to discourage theft of lead and water, as well as making contamination or poisoning of the supply less likely.
3. Since the floor of the tunnel is well below ground level at the doorway, the tunnel itself may have been designed to act as a floodable overflow chamber. Although the flow of the springs is believed to have been fairly constant, seasonal variations may have occurred, and water would also have backed up in the pipes if the stopcocks lower down the system were closed for maintenance.

Coombe Conduit House is maintained by English Heritage and open to the public on a number of Sundays from April to September. Dates are posted on the events page of the Kingston-upon-Thames Society website (www.kingstonuponthamessociety.co.uk). Of the adjacent sites, Gallows Conduit is in a private garden and inaccessible, although there are pictures available online. Ivy Conduit has been restored and appears as a semi-subterranean grotto in the grounds of Holy Cross Preparatory School. It can be viewed on open days or by application to Michael Harrison, the Premises Manager. Contact the School on 0208 942 0729. There is a photograph on the School website. Gallows Tamkin is on the nearby Golf Course. When asked they were happy for me to view it.

Further information:

An excellent guide booklet and a shorter leaflet are available on open days or from Michael Harrison at Holy Cross Prep. School:

Panizzo, P and Lown, S 2006 *The Conduit Houses of Coombe – the ancient water supply to Hampton Court Palace*. (PWP Press).



Upper Tower - Photo by David Gordon

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